COMMONWEALTH MYCOLOGICAL INSTITUTE

REVIEW
OF
APPLIED MYCOLOGY

VOL. XXXI SEPTEMBER 1952

PLANT (W.). **Molybdenum deficiency in Lettuce.**—*Nature, Lond.*, 169, 4306, p. 803, 1 fig., 1952.

In an experiment carried out at Long Ashton Research Station, Bristol, Borough Wonder lettuces were sown in soil known to cause molybdenum deficiency in cauliflower [cf. *R.A.M.*, 28, p. 494; 31, p. 96]. The treatments applied were: none (soil pH 5·2), gypsum 3 tons per acre (pH 4·9), ground limestone 3 and 6 tons (pH 6·3 and 6·4, respectively), sodium molybdate 2 and 4 lb. per acre (pH 5·4 and 5·2, respectively), and gypsum 3 tons+sodium molybdate 2 lb. (pH 5). The corresponding yields were, respectively, 32, 24, 59, 56, 45, 64, and 62 cwt. per acre, and the amounts of molybdenum (p.p.m.) in dry matter of leaves were, respectively, 0·06, 0·06, 0·09, 0·14, 0·08, 0·08, and 0·1. These results confirm the general experience that molybdenum deficiency can be corrected by raising the soil pH to a level where molybdenum becomes available.

GODFREY (G. H.). **Foliage diseases of Cucurbits in the Lower Rio Grande Valley of Texas in 1951.**—*Plant Dis. Reptr*, 36, 2, p. 69, 1952. [Multilithed.]

Leaf blight (*Alternaria cucumerina*) [*R.A.M.*, 30, p. 311] on cantaloupes in the Lower Rio Grande Valley, Texas, in 1951, was the most severe outbreak for the last 14 years. Selfed seed was obtained from some of the few apparently resistant plants.

LIHNELL (D.). **Några värdväxter för Cucumis-virus 1 i Sverige.** [Some host plants of *Cucumis*-virus 1 in Sweden.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1951*, 4, pp. 52–57, 7 figs., 1951.

Spinach appears to be the only indigenous crop in Sweden to suffer extensive damage from *Cucumis* virus 1 [cucumber mosaic virus: *R.A.M.*, 22, p. 88], but a few plants of *Bunias orientalis*, a common and troublesome weed in the east of the country, showed a conspicuous mottling in 1941. The symptoms resulting from sap inoculation to a number of other plants, including tobacco, *Nicotiana glutinosa*, *Datura stramonium*, larkspur [*Delphinium*], and chickweed, left no doubt as to the identity of the virus with cucumber mosaic. The diseased *B. orientalis* plants were distinctly stunted and produced considerably less seed than the surrounding healthy ones. Other hosts of the virus are the ornamentals *Aristolochia durior* and *Lonicera periclymenum*.

WALKER (J. C.) & GALLEGLY (M. E.). **Plant nutrition in relation to disease development. VI. Black rot of Cabbage and ring rot of Tomato.**—*Amer. J. Bot.*, 38, 8, pp. 663–665, 2 figs., 1951.

In further work in the Department of Plant Pathology, University of Wisconsin, Madison [cf. *R.A.M.*, 29, p. 181, and next abstract], black rot of cabbage (*Xanthomonas campestris*) [ibid., 31, p. 96] and tomato ring rot (*Corynebacterium sepedonicum*) [ibid., 25, p. 439] were studied in nutrient solutions. Black rot decreased but

ring rot increased in severity with an increase in the concentration level of nutrients. Unbalanced nutrients had no significant effect on either disease. From the studies of vascular diseases made so far, it appears that pathogens utilizing inorganic nitrogen in the culture medium tend to decrease in severity with an increase in the nutrient concentration level supplied to the host, while those requiring organic nitrogen exhibit the opposite effect.

Wei (C. T.), Walker (J. C.), & Scheffer (R. P.). **Plant nutrition in relation to disease development. VII. Cucurbit wilts.**—*Amer. J. Bot.*, 39, 4, pp. 245–249, 1952.

Further studies in this series [see preceding abstract] were made on vascular disease of watermelon (*Fusarium oxysporum* f. [*F. bulbigenum* var.] *niveum*) [*R.A.M.*, 31, p. 362] and bacterial wilt of cucumber (*Erwinia tracheiphila*) [ibid., 30, p. 505] by the nutrient solution method [ibid., 29, p. 181]. Dixie Queen watermelon plants inoculated *in situ* by pouring the fungus suspension into trenches between the plants when 10 to 12 in. high were incubated at 25° to 30° C. A bacterial suspension was introduced into the hypocotyls of National Pickling cucumbers through punctures when the plants were 5 to 12 in. high.

As the concentration of salts in balanced Hoagland's solution increased there was a decrease in the rate and amount of disease development in watermelon and an increase in the development of cucumber wilt. When unbalanced nutrients were supplied the disease index of watermelon wilt increased decidedly only with high potassium, while bacterial wilt increased significantly in cucumber with low nitrogen and low potassium.

Marchionatto (J. B.). **Antagonismo entre Rhinotrichum griseo-roseum y Cercospora capsici.** [Antagonism between *Rhinotrichum griseo-roseum* and *Cercospora capsici*.]—*Cienc. e Invest.*, 7, 11, p. 519, 2 figs., 1951.

In a further series of experiments on the antagonism exhibited by *Rhinotrichum griseo-roseum* [*R.A.M.*, 24, p. 75] the same phenomenon was manifested in cultures with *C. capsici* on 2 per cent. potato agar at a temperature of 22° C. The development of both species was very slow, but finally *R. griseo-roseum* overran *C. capsici*, covering its colonies with mycelium and spores. Subcultures of the invaded colonies gave rise to *R. griseo-roseum* only.

Porter (D. R.) & Younkin (S. G.). **Yolo Wonder Pepper.**—*Seed World*, 70, 3, pp. 8, 50, 4 figs., 1952.

Yolo Wonder, a new [chilli] pepper variety resembling California Wonder in fruit type and resistant to tobacco mosaic virus [*R.A.M.*, 31, p. 274], has been developed in California from a cross between California Wonder (susceptible) and Elephant Trunk (resistant). In tests at Milpitas and at Davis, California, in 1951 Yolo Wonder produced a higher percentage of extra fancy and fancy fruits than California Wonder, the marketable yield of the former being 26·9 tons per acre and of the latter 18·2 tons.

Costa (A. S.) & Alves (S.). **Mosaico do Pimentão.** [Chilli mosaic.]—*Bragantia, S. Paulo*, 10, 3, pp. 95–96, 1 pl., 1950. [English summary.]

The results of studies on a chilli mosaic, which is very prevalent in São Paulo, Brazil, indicate that the virus responsible for the disease belongs to the potato virus Y group and is probably similar to the one attacking the same host in Puerto Rico [*R.A.M.*, 24, p. 494; 30, p. 451]. There was no indication of resistance in six varieties tested by mechanical inoculation though Porto Rico Wonder showed

a measure of tolerance. At least four species of aphids are concerned in the transmission of the virus, viz., *Myzus persicae*, *Macrosiphum solanifolii*, and two undetermined, one of which is commonly encountered on *Solanum nigrum*.

NORMANHA (E. S.) & PEREIRA (A. S.). **Aspectos agronômicos da cultura da Mandioca (Manihot utilissima Pohl).** [Agronomic aspects of the cultivation of Cassava (*Manihot utilissima* Pohl).]—*Bragantia, S. Paulo*, 10, 7, pp. 179–202, 4 pl., 1950. [English summary. Received May, 1952.]

The following items of phytopathological interest occur in this paper on cassava cultivation in São Paulo, Brazil. Several common varieties and clones arising from seedlings were found to show greater resistance to bacterial wilt (*Xanthomonas manihoti*) [*R.A.M.*, 17, p. 650; 26, p. 333] than those usually cultivated, the most promising being S–59–36, S–59–49, S–59–52, S–59–53, S–59–78, S–59–89, S–59–130, S–59–133, and S–59–140, all derived from No. 59 Branca de Sta Catarina; and S–199–4, S–199–18, S–199–19, S–199–30, and S–199–41, from No. 199 Raiz Comprida [Long Root]. Cuttings of the resistant types were released for general use.

The results of tests in areas infested by the witches' broom or 'superbudding' virus [ibid., 24, p. 440], which precludes the cultivation of the susceptible Vassourinha variety, demonstrated a high degree of resistance in Brava da Ponte and a moderate grade in Preta [Black] and Holandi do Itaguá.

BERAN (F.) & HENNER (J.). **Kurze Übersicht über die Bekämpfung der wichtigsten Rebkrankheiten und Rebschädlinge.** [A brief survey of the control of the principal Vine diseases and Vine pests.]—46 pp., 21 col. figs., Vienna, Bundesanstalt für Pflanzenschutz, 1951.

This useful booklet presents in a convenient and readily intelligible form the essential information on the occurrence, recognition, importance, life-history of the pathogens, and control of the following vine diseases in Austria: downy mildew (*Plasmopara viticola*) [C.M.I. map No. 221], mildew (*Uncinula necator*), 'roter brenner' (*Pseudopeziza tracheiphila*) [*R.A.M.*, 13, p. 543], grey mould (*Botrytis cinerea*) [cf. ibid., 31, p. 316], root rot (*Rosellinia necatrix*), canker (*Pseudomonas* [*Bacterium*] *tumefaciens*) [ibid., 14, p. 740], and chlorosis. It further includes a list of fungicides, with their specific applications, and a control calendar.

CECCARELLI (V.). **Il comportamento della poltiglia bordolese usata nei trattamenti della Vite, in zone ove l'atmosfera è inquinata da gas solforosi.** [The reaction of Bordeaux mixture used for vine treatments in areas where the atmosphere is polluted with sulphur gas.]—*Ric. sci.*, 20, 6, pp. 831–832, 1 col. pl., 1950. [Received 1952.]

Observations for over ten years have shown that in areas where sulphur gases (sulphur dioxide, sulphur trioxide, and hydrogen sulphide) [*R.A.M.*, 18, p. 561; 23, p. 69; 28, p. 440] are emitted either continuously or sporadically, droplets of Bordeaux mixture applied to vine leaves against *Plasmopara viticola* change from blue to a dark metallic, leaden shade. Sometimes the lamina beneath turns yellow and withers until the whole leaf is affected. This effect occurred even when no damage was sustained by plants notoriously susceptible to sulphur.

PEYER (E.). **Mangelerscheinungen an den Reben.** [Deficiency symptoms on Vines.] —*Schweiz. Z. Obst- u. Weinb.*, 60, 19, pp. 364–365, 1 fig., 1951.

Symptoms of nutritional deficiency [cf. *R.A.M.*, 27, p. 216] are most conspicuous in Swiss vineyards just before the grapes ripen. There are three principal forms. In the most common, affecting Riesling × Sylvaner, the interveinal areas of the

leaves turn blackish, a sign of general shortage of soil nutrients, which may be arrested by drastic pruning in the following spring combined with liberal applications of a complete fertilizer during the winter.

Another increasingly prevalent type is characterized by desiccation of the leaf margins and interveinal areas, preceded in the latter first by reddening and then by yellowing. The leaves develop blisters and interveinal arching, while the margins curve downwards. In severe cases the grapes fail to ripen at all, and even in milder forms of the disorder the quality of the fruit is considerably impaired. Symptoms of this nature are frequently observed after the first large yields from new plantings or in plots producing record harvests in recent years and the current season. In many experiments copious applications of potassium have remedied the deficiency [ibid., 24, p. 89; 25, p. 151; 29, p. 196], which may be rectified in the early stages by the measures mentioned above and an additional soil amendment of 4 kg. potassium sulphate per acre.

Exhaustion of the vines resultant on over-bearing is manifested, especially in new plantings of Blue Burgundy clone selections, by premature (August) autumnal reddening of the foliage [loc. cit.], while the grapes fail to ripen and are of inferior quality. Either the root system of the young plants is insufficiently developed or certain elements are lacking in an available form. Individuals annually developing a blue-red discoloration at the outset of ripening should be eliminated from the stand.

Raychaudhuri (S. P.), Lal (S. B.), & Vasudeva (R. S.). **Further studies on Cucumis virus 2C.**—*Indian Phytopathology*, 3, 2, pp. 182–190, 1951.

Further studies at the Indian Agricultural Research Institute, New Delhi, on *Cucumis* virus 2C [a strain of cucumber green-mottle mosaic: *R.A.M.*, 30, p. 259] isolated from *Lagenaria leucantha* showed that the inoculum is infective over a pH range 1·88 to 9·96, though pH stability is influenced by temperature and duration of storage. In standard extract the virus is resistant to 1 to 2 per cent. nicotine sulphate, 40 per cent. hydrogen peroxide, 0·5 per cent. potassium permanganate, 0·5 per cent. carbolic acid, 0·5 per cent. silver nitrate, 0·1 to 0·25 per cent. mercuric chloride, 50 per cent. alcohol, 50 per cent. glycerin, and 50 per cent. acetone. It is inactivated in 24 hours by 50 per cent. hydrogen peroxide, 1 per cent. potassium permanganate, 1 per cent. carbolic acid, 1 per cent. silver nitrate, and 0·5 per cent. formalin, and becomes innocuous after one hour's treatment with 2 per cent. potassium permanganate or 1 per cent. formalin. Inactivation also results from exposure to ultra-violet light for two hours.

Lindner (R. C.), Kirkpatrick (H. C.), & Weeks (T. E.). **Ultraviolet absorption spectra as a tool for diagnosing plant virus diseases.**—*Science*, 115, 2992, pp. 496–499, 4 graphs, 1952.

Over 3,000 healthy and diseased plants of various species (chiefly stone fruits) were examined for virus diseases [*R.A.M.*, 31, p. 127] by a method evolved at the Division of Plant Pathology, Washington State College Tree Fruit Experiment Station, Wenatchee, in co-operation with the United States Department of Agriculture. With small plants a minimum of three leaf samples from each plant, each comprising one or two disks $\frac{1}{4}$ in. in diameter, using mature leaves of different ages, were punched from the mid-vein region or a large lateral vein, to include both phloem and xylem, and heated in a water bath at 80° C. for ten minutes with 1 ml. 70 per cent. ethyl alcohol. This procedure was repeated twice until all the chlorophyll was extracted. The sample was then heated in a water bath for 30 mins. at 80° with 3 ml. of a 1:9 mixture of hydrochloric acid in 95 per cent. alcohol, cooled, the mixture decanted into a silica absorption cell, and spectrophotometer readings taken at 2-mμ intervals in the 230 to 300 mμ range.

Characteristic absorption curves for nucleic acid or its hydrolysis products were obtained for leaf tissue considered to be healthy, the height of the absorption peak at 260 mμ being a measure of the amount of nucleic acid present. The ring spot type viruses produced a distinctive curve with a peak at or near 270 mμ, while those for sour cherry yellows and peach western X-disease [? strain of peach X-] viruses were at or near 280 mμ. The absorption curve confirmed that cherry yellows is a complex of at least two viruses [ibid., 28, p. 339]. Peach western X-disease gave a complex absorption curve which may be due to a mixture of several viruses. Consistent peaks occurred at 274 to 276 mμ and at 280 to 282 mμ. A purified preparation of tobacco mosaic virus gave a curve similar to that obtained from leaves infected with the virus. Stone fruit viruses were detected by this method in cucumber cotyledons 48 hours after inoculation. Alteration in the nitrogen content of the plants affected only the height of the peak of the curve and not its position. This method is also suitable for detecting virus diseases of herbaceous plants.

Pflanzenschutzbestimmungen in Deutschland. Bundesrepublik Deutschland. Verordnung über den Anbau krebsanfälliger Kartoffelsorten. Vom 24.August 1950. [Plant protection regulations in Germany. Federal Republic of Germany. Order of 24th August, 1950, relating to the cultivation of wart-susceptible Potato varieties.]—*Amtl. PflSchBestimm.* (formerly *Beil. NachrBl. dtsch. PflSchDienst*), N.F., 3, 5, p. 273, 1951.

This order prohibits the cultivation in the Federal Republic of Germany, as from 1st March, 1953, of the potato varieties Centifolia and Allerfrüheste Gelbe on the grounds of their susceptibility to wart disease [*Synchytrium endobioticum*: *R.A.M.*, 19, p. 320; 29, p. 529; C.M.I. map No. 1]. As from 1st July, 1952, 'seed' of the same two varieties may no longer be put on the market. The cultivation of and commerce in Erstling [Duke of York] are permitted.

STOREY (H. H.). **Basic research in agriculture. A brief history of research at Amani 1928–1947.**—24 pp., 7 pl., East African Agriculture and Forestry Research Organization, Kenya, [? 1951. Received February, 1952.]

In this publication the author succinctly reviews some of the agricultural research work conducted from 1928 to 1947 at the East African Agricultural Research Institute, Amani. In the section dealing with plant diseases (pp. 15–19) [cf. *R.A.M.*, 31, p. 7] reference is made to the studies carried out on virus diseases, including the virus-insect relationship in maize streak [ibid., 19, p. 207], tobacco leaf curl [ibid., 11, p. 676; 15, p. 118], groundnut rosette [ibid., 12, p. 143; 31, p. 315], and cassava mosaic [ibid., 18, p. 230] and brown streak [ibid., 29, p. 399]. The work done on tea yellows in Nyasaland [ibid., 12, p. 537] is also recapitulated.

Sixty-second Annual Report Georgia Experiment Station, 1949–50, 92 pp., 14 figs., [? 1951].

This report [cf. *R.A.M.*, 29, p. 604] contains the following items of phytopathological interest. A wild species of groundnut, probably a form of *Arachis diogoi*, from Brazil appeared to be immune from *Cercospora* leaf spot [*C. arachidicola* and *C. personata*: ibid., 29, p. 605; 31, p. 101]. In a test planting of groundnuts in rather heavy soil anhydrous ammonia gave no significant reduction of white mould (*Sclerotium rolfsii*) [ibid., 29, p. 605]. When both cost and fungicidal efficacy are considered, no fungicide has yet proved satisfactory for the control of this disease.

When Coker 100 Wilt cotton seed [ibid., 24, p. 406; 28, p. 172] was treated with various fungicides against [unspecified] seedling diseases survival was 34·7, 34·6, 34·5, 34·4, 33·1, 32·2, 32, 31·6, 30·1, 29·2, 29, 24·7, and 23·7 per cent. for cal. 406,

arasan, seedox, dow 9B, UCC 640, ceresan M, UCC 201, spergon 120, 5400, vancide, yellow cuprous oxide, 854, and phygon, respectively, compared with 22·2 for the untreated. Progress is continuing in developing strains resistant to angular leaf spot [blackarm: *Xanthomonas malvacearum*: see below, p. 432] from crosses between Empire and Stoneville 20 [cf. ibid., 25, p. 448; 30, p. 519]. Some lines developed from material back-crossed to Empire have shown virtual immunity combined with moderately satisfactory agronomic qualities.

Isolates of *Rhizoctonia* [*Corticium*] *solani*, causing leaf blotch of tall fescue [*Festuca elatior* var. *arundinacea*: ibid., 31, p. 19], showed great variation in pathogenicity to fescue. Field observations in 1949 indicated that several of the fescue strains at the Georgia Experiment Station were resistant, but became severely infected when artificially inoculated with a virulent strain of the fungus in the greenhouse. Some of the fescue strains appear to be highly field-resistant to net blotch (*Helminthosporium dictyoides*) [ibid., 31, p. 330].

The most serious diseases of white clover as regards reduction of stands in summer, which appears to be the critical period for survival, are summer blight (*C. solani*) [cf. ibid., 20, p. 583; 28, p. 127] and white mould (*S. rolfsii*) [cf. ibid., 21, p. 527; 31, p. 332].

A survey conducted over a number of years showed that the following soy-bean varieties possess some degree of resistance to bacterial pustule [*X. phaseoli* var. *sojensis*: ibid., 31, pp. 163, 367]: L 4–6290, Ogden, Hale, Dortchsoy, N 540–1, N 45–2885, N 45–3728, N 45–2994, Oklahoma 710, F.C. 31592, Cherokee, and Seminole.

Rapport annuel pour l'exercice 1950. [Annual report for the year 1950.]—*Publ. Inst. nat. Étude agron. Congo belge, 1951* (hors sér.), 392 pp., 1 map, 1951.

The following items occur in the sections of this report dealing with phytopathological work in the Belgian Congo [cf. *R.A.M.*, 30, p. 512]. At the Bambesa Station (pp. 64–65) mulching with straw arrested the spread of wilt due to *Fusarium vasinfectum* [ibid., 30, p. 513] in the soil and favoured the multiplication of *Trichoderma* [*viride*: ibid., 31, p. 238], the antibiotic properties of which may, perhaps, contribute to the suppression of the wilt organism.

Inoculations of coffee seedlings (*Coffea robusta* line Y. 410) at Yangambi (pp. 90–91) by dipping the roots in a culture solution of the tracheomycosis organism [*Gibberella xylarioides*: ibid., 30, pp. 228, 466] resulted in infection after one month and a half. Significant differences in susceptibility between different lines [ibid., 29, p. 618] have been confirmed, and attempts are in progress to select resistant clones and lines. Of 13 lines tested the three most susceptible, Y. 410, S.A. 24, and Y. 420 showed in September, 1950, 47, 37, and 26 per cent. mortality, respectively, while the least affected lines, L. 34 and L. 52, showed 8 and 13 per cent., respectively.

In work at the Yangambi centre (pp. 84–91) it was found that damping-off of coffee seedlings was due mainly to *Botrytis cinerea*, which was present also in a few plantations, and was controlled by sprinkling the ground before sowing with aretan solution at the rate of 10 gm. per sq. m.

A leaf disease of *Hevea* rubber (mainly *Helminthosporium heveae*) [ibid., 25, p. 358], widely prevalent in nurseries, appeared to be associated with seasonal climatic factors. Blast of young rice plants (*Piricularia oryzae*) [C.M.I. map No. 51] was more severe in places where ash, following burning [cf. ibid., 30, p. 286], had accumulated than it was elsewhere. At Lilanda young rice which had suffered such attacks was parasitized at the end of the vegetative period by *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] and *Fusarium* sp. Preventive treatment of oil palm seed against bacterial rot [unidentified: ibid., 30, p. 512] with dry or wet certosan (0·1 per cent.) had no adverse effect on germination.

Brown bast of *Hevea* rubber (pp. 141–142) [loc. cit.] is still present in most fields of grafted plants and seedlings. Cases fall into three categories: (1) arrested or irregular flow of latex; (2) bark necrosis with vertical cracking; (3) woody nodules on the trunk. The degree of susceptibility of different clones is generally transmitted to the progeny, but to a lesser extent. The rate of infection of rubber trees by *Fomes* [*lignosus*: loc. cit.] appeared to be less in fields planted without previous burning; wide spacing between the rows and close planting within them markedly reduced the number of trees attacked.

At the Mulungu-Tshibinda Experiment Station (pp. 244–250) incidence of *Chrysanthemum cinerariifolium* bud rot (*Ramularia bellunensis*) [cf. ibid., 30, p. 308] was significantly reduced by a fertilizer dressing containing 15 parts nitrogen, 15 phosphorus, and 70 potassium. Improved cultural methods (cutting the clumps to ground level at the end of the dry season, removing all old parts, and hoeing in the cuttings and weeds) greatly reduced the incidence and gave increased resistance to the disease. The Bibatama variety appears to show resistance. Spraying with Bordeaux mixture reduced infection to 25 per cent. of the figure for the unsprayed controls, but in view of the quantity of the fungicide used (1·225 kg. dry material in 28 cu. m. of water per ha.) the procedure appears to be uneconomic.

Crownover (Ruth), Mandel (J. D.), & Eisenstark (A.). **Studies of a bacterial virus active against Xanthomonas pruni (Holmes).**—*Proc. Okla. Acad. Sci.*, 31, pp. 40–42, 1950 (published 1951). [Received July, 1952.]

Studies at Oklahoma Agricultural and Mechanical College, Stillwater, showed that *Phagus pruni*, the bacteriophage of *Xanthomonas pruni* [*R.A.M.*, 30, p. 313], was slightly less active at 65° C., but the inactivation temperature was 70° for ten minutes. It retained 10 per cent. of its activity in the presence of 6M (30 per cent.) ethyl alcohol, but was completely inactivated by 20M (90 per cent.), and by phenol at concentrations greater than 0·5M. It was slightly inhibited by ten and 15 minutes' exposure to an ultra-violet lamp, almost completely inactivated after 30 minutes, and its lytic effect was completely destroyed by one hour's exposure. It remained active at all the investigated pH values (5·2 to 8) that permitted the growth of *X. pruni*.

Braun (A. C.). **Recovery of crown-gall tumor cells.**—*Cancer Res.*, 11, 2, pp. 839–844, 4 pl., 1951.

In this expanded account of the author's studies on crown gall [*Bacterium tumefaciens*: *R.A.M.*, 30, p. 455; cf. also ibid., 31, p. 175] in Turkish tobacco, evidence is presented showing that the position of a cell at the time of its alteration is a decisive factor in determining the type of tumour that will develop as a result of the action of the tumour-inducing principle.

Demaree (J. B.) & Smith (N. R.). **Blueberry galls caused by a strain of Agrobacterium tumefaciens.**—*Phytopathology*, 42, 2, pp. 88–90, 2 figs., 1952.

At the Plant Industry Station, Beltsville, Maryland, two strains of a bacterium forming galls on blueberry [*Vaccinium* spp.] in New Jersey were isolated and studied. Inoculated into the meristematic tissue of blueberry plants, the organism repeatedly caused the development of large galls but failed to do so on *Kalanchoe* and induced doubtful reactions on aster. Two strains of *Agrobacterium* [*Bacterium*] *tumefaciens* [see preceding abstract], one from apple and the other from peach, produced large excrescences on *Kalanchoe* [*R.A.M.*, 31, p. 321] and aster but gave negative results on blueberry. In cultural characters the blueberry bacterium presents close analogies with the two strains of crown gall and it also formed small overgrowths on several hosts of *B. tumefaciens*. Pending further investigations, therefore, it is considered to be a strain of the same species. Although the galls

were similar to those attributed to *Phomopsis* sp. [ibid., 27, p. 30], no evidence was obtained of the presence of this organism. Similar galls were also collected in New York, Michigan, Washington, and British Columbia.

WILSON (J.) **The breeding of Cacao.**—*J.* [formerly *Proc.*] *agric. Soc. Trin. Tob.*, 51, 3, pp. 303–314, 1951.

Controlled crossing experiments are being carried out at the Imperial College of Agriculture, Trinidad, between the cacao clones I.C.S. 1 and two lines of S.C.A., 6 and 12, known to carry some degree of resistance to witches' broom [*Marasmius perniciosus*: *R.A.M.*, 28, p. 162; 30, p. 456; 31, pp. 56, 300, and next abstract], in order to determine the mode of inheritance of this character.

Third Conference of the Inter-American Technical Cacao Committee, 1950.—*Cacao* (*Int.-Amer. Cacao Cent.*), 2, 11–12, pp. 1–15, 4 figs., 1950.

In the section on pests and diseases it is reported that experiments at the Inter-American Cacao Centre, Turrialba, Costa Rica, showed that *Phytophthora palmivora* on cacao [*R.A.M.*, 28, p. 564; 30, p. 145; 31, pp. 56, 232, and next abstracts] and some of what was thought to be physiological cherelle wilt [see next abstract] can be controlled economically by applications of Bordeaux mixture even where damage is heavy. In a nursery-bed trial for evaluation of fungicides on inoculated seedlings, SR 406 and phygon gave higher percentages of control than Bordeaux seven days after spraying, but not after 14 and 21 days.

A method described in Ecuador for selection of seedlings resistant to witches' broom (*Marasmius perniciosus*) [see preceding abstract] consists in inoculating seedlings at the two-leaf stage in a seed bed with a spore suspension prepared from brooms which are sprayed with water and kept in a moist chamber. Plants which do not contract infection are planted out in the field and those which combine resistance with high yield are multiplied. In recent preliminary experiments in Ecuador seeds were submerged in a spore suspension of *M. perniciosus* before germination and so far have shown 100 per cent. embryo infection compared with 60 to 50 per cent. obtained on young seedlings; it is hoped that by varying the concentration of the suspension and the period of immersion it will be possible to separate a very small percentage of the most highly resistant seeds.

BARTOLOMÉ (R.). **Effect of fertilizer application on the incidence of cherelle wilt of Cacao.**—*Turrialba, Rev. Inst. interamer. Cienc. agric.*, 2, 1, pp. 9–11, 1952.

Studies carried out during 1950 at the Inter-American Cacao Centre Experimental Farm, La Lola, Costa Rica, showed no possibility of decreasing cherelle wilt of cacao [associated with *Phytophthora palmivora*: *R.A.M.*, 31, p. 374, and see preceding and next abstracts], the incidence of which is lower than in Trinidad, by means of soil applications of potassium, phosphorus, or nitrogen, possibly owing to the absence of a dry season or to the inherent fertility of the soil in this region. Practically all the wilted cherelles (young fruits less than 75 days old) bore lesions, some apparently caused by insects and others by fungi [unspecified], which are under study.

[This information appeared also in *Cacao* (*Int.-Amer. Cacao Cent.*), 2, 13–24, pp. 6–10, 1951.]

Report of Cocoa Conference held at Grosvenor House, London, 11th to 13th September, 1951.—xiii+152 pp., 2 pl., 2 diags. (1 col.), 8 graphs (6 col.), 16 maps (12 col.), London, The Cocoa, Chocolate and Confectionery Alliance, Ltd., [1951].

In this report [cf. *R.A.M.*, 30, p. 455] G. F. BOWMAN (pp. 40–54) states that at the Inter-American Cacao Centre, Turrialba, Costa Rica, inoculation with *Phytoph-*

thora palmivora [see preceding abstracts] of unwounded and wounded pedicels and flower cushions of 150 cacao fruits up to 10 cm. long, caused the death of 98, 94, and 62·7 per cent. of the fruits, respectively. With *Colletotrichum gloeosporioides*, *Diplodia* [*Botryodiplodia*] *theobromae*, and *Fusarium moniliforme* [*Gibberella fujikuroi*] under 20 per cent. deaths ensued. In June, July, and August, 1950, membracid insects caused approximately 5 per cent. of the loss due to cherelle wilt [loc. cit.] and *P. palmivora* about 20 per cent. The weakening effects of *P. palmivora* on cacao are much greater than has been realized; in Costa Rica it causes a high percentage of tip blight or die-back of chupons and branches, generally attributed to *Botryodiplodia* [ibid., 31, p. 9] or *Colletotrichum*, and also defoliation of both young and mature leaves. Shade is more valuable as a protection against the disease than against excessive light; trees directly under shade remain wet with dew for a much shorter period in the morning than the others. For spraying mature trees against *P. palmivora* a high-pressure pump is used with a triplex nozzle spray gun emitting a very highly dispersed cloud of fungicide. So far, 14 new fungicides have been tested but none has proved as efficacious as Bordeaux mixture; yields can be virtually doubled by monthly applications of 150 gals. 1 per cent. mixture per acre. Applications of 1·25 per cent. Bordeaux at 30- and 60-day intervals from 1946–50 gave mean yields of 1,251 and 1,037 kg. dry cocoa per ha. per year, as compared with 620 kg. from unsprayed trees. At a selling price of $0.44 per kg. and a cost of maintenance, harvesting, and curing estimated at $82.90 per ha. the unsprayed cacao would show a net profit of $189.90 per ha., whereas with spraying costs amounting to $228.06 per ha. for a 30-day spray cycle a net profit of $322.38 per ha. would result, while the 60-day cycle, with costs amounting to $165.05 per ha., would give one of $291.23 per ha. Cultural methods of control gave disappointing results.

A very serious root disease of small seedlings, becoming progressively worse as the nursery was used for the third or fourth time, is thought to be due to a *Pythium*, probably *P. debaryanum*. Emergence and growth were poor, the tips were bare, the stems with lesions, the roots poorly developed, dead and lesioned, and many plants died when only four or five inches high. A 10 cm. mulch of sawdust gave effective control and is now used in all nursery planting.

Reporting on cacao research at the Imperial College of Tropical Agriculture, Trinidad, Professor C. Y. Shephard (pp. 58–63) states that at River Estate, while a statistically significant reduction in pod loss from [unspecified] fungal attack followed Bordeaux spraying, a significant reduction in the number of pods reaching maturity also resulted, indicating that spraying would be uneconomic under most local conditions. Incidence of virus disease [ibid., 30, p. 457] has increased from 57 affected trees out of 2,304 in 1944 to 1,154 in 1951; in a good cropping season the disease causes a statistically significant reduction in yield proportionate to the duration of infection.

J. West (pp. 86–89), dealing with work at the West African Cacao Research Institute, Tafo, Gold Coast, on systemic insecticides carried out with Pest Control, Ltd. [ibid., 31, p. 233], describes a pilot experiment designed to check the use of CR 409 [loc. cit.] in combination with cutting out in a plot of 2,457 trees, of which 602 were visibly infected with swollen shoot [see next abstracts]. On adjoining symptom-bearing and moribund trees, mealybug (*Pseudococcus njalensis*, *P. citri*, and *Ferrisia virgata*) counts ranged from 0 to 385 and 3 to 419 respectively. On 18th to 21st May the symptom-bearing trees in the plot were cut out, and on 18th to 22nd May the apparently healthy trees were given a first application of CR 409. In June, just before the second application, when the insecticide was at maximum efficiency, mealybugs infested 6·2 per cent. of the trees with trunk pods, the figures being 1·16 and 0·597 per cent., respectively, three and six weeks after the second treatment.

Reviewing the swollen shoot control campaign in the Gold Coast [ibid., 28, p. 163; 30, p. 456], S. D. Ross and J. D. Broatch (pp. 92–98) state that in the Special Area, Eastern Province, some 285,000 acres were intensively surveyed in the establishment of the disease-free belt. Excellent progress was made in initial treatment along the perimeter zone, in which there are now only scattered outbreaks. Good progress was made in the buffer zone, and there are hopeful prospects of saving large acreages. During the year's campaign (1950–1) 2,500,000 trees were cut out. In the General Area (Ashanti) virtually all known outbreaks were treated by 31st March, and the equivalent of only 2,322 acres of cacao were cut out to effect control over an area of 788,000 acres surveyed. In the Old Western Province nearly 250,000 trees were cut out. In the Eastern Province (Kwahu and North Birim districts adjoining the Special Area) numerous scattered outbreaks were found south of the Scarp, where over 500,000 affected trees were cut out. In Togoland and Trans-Volta no disease was found north of the Kpandu-Golokwati road, where two-thirds of the cacao is grown. South of this line the survey is almost complete; scattered outbreaks at Peki and Ho are under treatment and during the year the equivalent of only 45 acres had to be cut out. Infection of cacao directly from forest trees [ibid., 29, p. 205] must be anticipated in the future from time to time; every epidemic appears to have started in this way. When the present series of epidemics has been brought under control the authors envisage the maintenance of a permanent departmental patrol service to locate and combat primary outbreaks as they occur. These are likely to be single-tree infections and of uncommon occurrence, and initial spread within a five-year period, regarded as the true endemic phase, is not likely to be serious.

J. West in his paper (pp. 108–111) on the progress of research at the West African Cacao Research Institute (1950–51) [cf. ibid., 31, p. 231] states that in the rate of destruction experiment [loc. cit.] the proportion of trees infected with swollen shoot has risen to 92 per cent.; yield is negligible. Since 1947 the local practice of replanting with cacao beans sown at stake has been followed as the old trees succumbed; of 18,000 seedlings established, 348 had become infected by March, 1951. In the first ring of apparently healthy trees round a new outbreak 40 per cent. may be affected but show no symptoms. At Tafo, the cushion type of infection by *P. palmivora* [ibid., 28, p. 386 and preceding abstracts] is most prevalent during the early rains (June) and reaches a peak in August, while in the late rains (October) dissemination through the main crop by primary infection on the pod surface becomes more common.

R. J. Benstead describes (pp. 111–115) the successful re-establishment of cacao under a wide range of environmental conditions on farms previously devastated by swollen shoot in the Eastern Province of the Gold Coast. Establishment was most satisfactory on land which had either reverted to secondary bush, or was bearing cacao immediately before planting. Where all cacao is removed before replanting, infection by swollen shoot is restricted to the perimeter of the area where there are infective trees. Spread from one seedling to another is very limited until a closed canopy has formed.

R. Johns and A. V. Gibberd (pp. 135–143) state that after four years cutting-out has failed to control swollen shoot in Nigeria [ibid., 30, p. 456]; it has never been possible to maintain continuous, thorough, and accurate treatment. A sealing-off policy was adopted in July, 1950. Within the protective belt [loc. cit.] survey teams inspect every cacao farm once in six months. If an outbreak is discovered all infected trees are destroyed and the farms concerned become subject to re-inspection and re-treatment at intervals of not more than three months. In addition, survey teams maintain the same inspection service inside the perimeter of the area of mass infection to a depth of one mile and any foci of infection regarded as susceptible of control are treated in the same manner as those in the protective belt.

Posnette (A. F.) & Todd (J. McA.). **Virus diseases of Cacao in West Africa. viii. The search for virus-resistant Cacao.**—*Ann. appl. Biol.*, 38, 4, pp. 785–800, 1951.

In this further account of work at the West African Cacao Research Institute on cacao swollen shoot [cf. *R.A.M.*, 30, p. 219 and preceding and next abstracts] the results of ten years' search for virus-resistant cacao are described. Selections of trees found surviving in farms devastated by the disease, mostly of the West African Amelonado type, were propagated by budding, and the budlings tested by graft inoculation with virulent strains of virus 1A [ibid., 31, p. 231]. No selection displayed any resistance except that conferred by previous infection with a mild strain; some showed slight tolerance.

In tests of local selections and some new introductions using mealybug (*Pseudococcus njalensis*) vectors, and rooted cuttings, beans, and young seedlings, resistance was found only in Upper Amazon types from Ecuador [loc. cit.]. This genetical resistance appeared to be most marked in cacao from the Nanay peninsula, near Iquitos. None of the 20 *Theobroma mariae* seedlings inoculated and only four of the *T. bicolor* seedlings became infected; in other experiments seedlings of *T. balaoense* were immune.

Strickland (A. H.). **The entomology of swollen shoot of Cacao. II. The bionomics and ecology of the species involved.**—*Bull. ent. Res.*, 42, 1, pp. 65–103, 3 diags., 1951.

At the West African Cacao Research Institute, Tafo, Gold Coast, a method was devised and is here fully described for the routine quantitative estimation of the populations on cacao trees of *Pseudococcus njalensis*, the most important mealybug vector of the cacao swollen shoot virus [see preceding abstracts], and the results obtained from 24 successive monthly samples are tabulated. The quantitative data proved to be of such variability that only gross differences in population density are statistically significant.

No direct correlation could be established between mealybug density and the incidence of swollen shoot, though populations in areas devastated by virus tend to be smaller than where the disease is actively spreading. It is clear that *P. njalensis* is maintained by ant (*Crematogaster* spp.) protection at a density level considerably above that prevailing amongst related pseudococcid species which do not enjoy that advantage. Any future attempts to control the mealybugs by ant elimination must be designed as specific against the Crematogasterini and non-lethal to *Oecophylla* and the other large predatory ants prevalent on cacao.

Cherewick (W. J.) & Popp (W.). **Smuts of coarse grains in Manitoba.**—*Sci. Agric.*, 31, 11, pp. 496–504, 1951.

A seed-drill survey combined with seed sample tests of oats and barley was made in Manitoba from 1947 to 1949 to determine the number of heads infected with covered smut [*Ustilago hordei*] and loose smut [*U. nuda*] of barley and covered [*U. kolleri*] and loose [*U. avenae*] smuts of oats [*R.A.M.*, 23, p. 434; 31, p. 52]. Of the 47 per cent. of the farmers who treated their seed, 13 per cent. used older and less effective disinfectants (copper sulphate and formaldehyde) and averaged 2·1 and 2·2 per cent. smut, respectively, 55 per cent. used a treating machine and averaged 0·72 per cent., while others using the shovel, a loading auger, or other inferior methods of application, had an average of 1·32 per cent., those who gave no treatment having 2·25. Of the farmers using organic mercury [ibid., 30, p. 461], 35 per cent. stored their treated seed three days or less before sowing and 65 per cent. four days or more; average smut incidence in the two cases was 1·07 and 0·27 per cent., respectively. Regular, effective seed treatment practically eliminated smuts from the crops.

Pal (B. P.). **Wheat breeding investigations at the Indian Agricultural Research Institute.**—*J. Indian bot. Soc.*, 30, 1–4, pp. 1–13, 1951.

This presidential address, read before the 30th Annual Meeting of the Indian Botanical Society on 1st January, 1951, reviews the wheat work done since 1936 at the Indian Agricultural Research Institute, New Delhi, partly summarized elsewhere [*R.A.M.*, 23, p. 432]. The author deals in particular with the work done on wheat breeding for resistance to black, brown, and yellow wheat rusts [*Puccinia graminis*, *P. triticina*, and *P. glumarum*, respectively: ibid., 30, pp. 405, 511, 601], loose smut (*Ustilago tritici*) [loc. cit.], and flag smut [*Urocystis tritici*: ibid., 27, p. 315].

Orjuela Navarrete (J.). **Las royas del Trigo en Colombia.** [Wheat rusts in Colombia.]—*Rev. Acad. colomb.*, 8, 31, pp. 380–383, 2 col. pl., 1951.

These descriptions of wheat rusts (*Puccinia* spp.) in Colombia have already been noticed from another source [*R.A.M.*, 31, p. 371].

Henry (A. W.), Millar (R. L.), & Peterson (E. A.). **Control of covered smut of Wheat by rapid seed treatment with an antibiotic.**—*Science*, 115, 2978, pp. 90–91, 1952.

In preliminary greenhouse experiments carried out in 1951 at the Department of Plant Sciences, University of Alberta, spring wheat seed, naturally infected with spores of bunt (*Tilletia* spp.) and further contaminated artificially by the addition of 0·5 gm. of spores per 100 gm. seed, was treated with different amounts of actidione dusts [cf. *R.A.M.*, 30, p. 407], consisting of mixtures of powdered clay and the antibiotic, or with actidione diluted with a 0·02 per cent. aerosol and water mixture. The controls comprised one untreated series, clay dust only (1 oz. per bush.), and 0·02 per cent. aerosol and water (1 min. immersion). The seed was sown one day after treatment.

Four actidione treatments (0·5 per cent. dust at ½ and 1 oz. per bush., 1 per cent. dust at 1 oz., and 10 p.p.m. liquid, one minute immersion) all gave complete control, as against 22·9, 6·1, and 8·3 per cent. infection for the three controls, respectively. Germination was reduced slightly by the highest dosage of actidione. Field data, largely confirming these results, are to be reported later.

Gassner (G.). **Über Gaswirkungen quecksilberhaltiger Beizmittel.** [On the vapour action of mercury-containing disinfectants.]—*NachrBl. dtsch. PflSchDienst, Stuttgart*, 3, 8, pp. 113–117, 5 figs., 1951.

The results of further tests by the method already described [*R.A.M.*, 22, p. 490] on the applicability of the mercury alkyls [ibid., 22, p. 472] to the treatment of wheat seed against bunt [*Tilletia* spp.] confirmed previous conclusions as to the efficiency of these preparations, which is attributed to their high vapour pressure. The author personally investigated a number of cases of the deleterious effects, sometimes serious, on the health of workers using these compounds [ibid., 10, p. 535; 14, p. 707; 27, p. 317] in Germany between 1941 and 1945, and the results of experiments on rats corroborated the function of the mercury alkyls in the causation of the toxic symptoms.

Kleis (R. W.), Lucas (E. H.), Brown (H. M.), & De Zeeuw (D. J.). **Dry treatment of Wheat for loose smut (a preliminary report).**—*Quart. Bull. Mich. agric. Exp. Sta.*, 34, 2, pp. 162–165, 1951.

Experiments were carried out in Michigan during 1950 on the control of wheat loose smut [*Ustilago tritici*:*R.A.M.*, 31, p. 111] by radiant and dielectric heating. In testing the efficiency of the former, American Banner and Goens wheat samples at 12 per cent. moisture were held 10 in. below a 250-w. heat lamp at temperatures

ranging from 78° to 90° C. and 75° to 87°, respectively, the length of treatment varying from 270 secs. to 481 secs. and 315 secs. to 475 secs., respectively. Seed samples were sown in September, 1950. Smut incidence, assessed at full heading time, was reduced to zero only by the highest temperature, which lowered the emergence of American Banner from 83 to 63 per cent., spring survival from 62 to 46 per cent., and total number of heads from 353 to 181, the corresponding figures for Goens being 81 to 76, 65 to 62, and 361 to 359.

During winter and spring, 1951, 32 samples of smut-infected Illinois No. 1–128 spring wheat were subjected to dielectric heating between two galvanized iron plates, each mounted on a $\frac{1}{2}$ in. thermal insulation board. The grain was held, touching the plates, in a light cardboard ring 4·78 in. in diameter and power supplied from a 1-kw. Westinghouse industrial radio-frequency generator. Heating times varied from 277 secs. for a '60 sec.' temperature (i.e., the temperature 60 secs. after the power was switched off) of 78·8° to 618 secs. for one of 99°. There was no consistent relationship between type of treatment and smut incidence and in no case was it reduced to zero.

GARRETT (S. D.). **Some problems of intensive cereal cultivation.**—*J. Inst. Corn Merch.*, 2, pp. 147–151, 2 figs., 1950. [Received November, 1951.]

This information on the control of take-all (*Ophiobolus graminis*) and eyespot (*Cercosporella herpotrichoides*) of wheat and barley under intensive cereal cultivation has already been noticed [*R.A.M.*, 29, p. 253; 31, p. 279].

ADAM (D. B.). **The control of take-all in Wheat after a long period of pasture.**—*Aust. J. agric. Res.*, 2, 3, pp. 273–282, 1 diag., 1951.

An experiment to ascertain the effect of various periods of bare fallow and of the growth of certain crops upon the occurrence of take-all (*Ophiobolus graminis*) [*R.A.M.*, 30, p. 19; see preceding and next abstracts] in a subsequent wheat crop was carried out at the Waite Agricultural Research Institute, South Australia, on a piece of land which had carried a 'natural' pasture for at least 25 years. The field contained a variety of grasses infected by *O. graminis*. Bare fallow periods beginning in or before July in the year preceding seeding and growing oats for grazing during a similar period were equally effective in minimizing take-all. Shorter bare fallow periods and the growing of oats or peas to the stage of seed production were less effective. Barley as the preceding crop appeared to aggravate incidence. None of the treatments, which included bare fallow periods of more than twelve months, eliminated infection.

ANGELL (H. R.) & MILLS (MARGARET). **Rotation in relation to take-all of Wheat.**—*Aust. J. agric. Res.*, 2, 3, pp. 283–285, 1951.

At the Division of Plant Industry, Canberra, an infertile, sandy, alluvial soil was used in drums to test the effect of five four-year rotations (continuous wheat; wheat-*Ranunculus*-*Ranunculus*-wheat; wheat-grass-grass-wheat; wheat-oats-fallow-wheat; wheat-fallow-fallow-wheat) on the incidence of take-all (*Ophiobolus graminis*) [see preceding abstract] in Nabawa wheat. The diseased condition of the roots at harvest time in the final year was significantly worse in the *Ranunculus* (Stinton's Claremont Super Hybrid No. 9) series and oats (Algerian) series than in the continuous wheat and two years' grass (Wimmera rye grass [*Lolium rigidum* var. *strictum*]) rotations. The mean grain yield and mean total weight of the wheat plants in the *Ranunculus*, oats, and two years' fallow were, however, significantly higher than those in the other two rotations. Control, using yield as the criterion, appears to be attributable to accumulation of available plant food, and not to the elimination or any decrease in the amount of *O. graminis* in the soil.

Tapke (V. F.). **Further studies on environment after seedling emergence and other factors that influence the incidence of Barley covered smut.**—*Phytopathology*, 42, 3, pp. 117–118, 1 graph, 1952.

At the Plant Industry Station, Beltsville, Maryland, in 1944 the combined influence of each of five soil temperatures (40°, 50°, 60°, 70°, and 80° F.) during seedling emergence and field or greenhouse conditions after emergence on the incidence of barley covered smut (*Ustilago hordei*) [*R.A.M.*, 29, p. 18] were studied on the Hannchen (C.I. 531) and Pannier (C.I. 1330) spring varieties, which were seed-inoculated in mid-January by the spore suspension method [ibid., 22, p. 201]. Each of the 20 combinations of the two varieties, the five soil temperatures, and two post-emergence environments (temperate greenhouse and outdoor cold frame) was replicated in three flats of 250 to 275 plants each. Moderate temperatures (55° to 70°) both before and after emergence proved to be more favourable to infection than extremes.

In a final study in 1945 Hannchen only was inoculated by spore suspension and superficial dusting [loc. cit.], the other procedures being the same as in 1944. The former method gave three times as much infection as the latter and plants grown in the greenhouse after emergence were twice as heavily smutted as those grown outdoors.

Shumilenko (E. P.). Специализация корончатой ржавчини Овса [Specialization of the crown rust of Oats.]—*Bot. Zh.* [*J. bot. U.S.S.R.*], 36, 6, pp. 635–642, 1 diag., 1951.

In studies at the Pan-Soviet Institute of Plant Protection, Leningrad, *Rhamnus pallasii* was found to be an alternate host of oat crown rust (*Puccinia coronata*) in the U.S.S.R. [*R.A.M.*, 30, p. 62]. Eradication of *R. pallasii* is recommended as a preventative measure against further oat infection. The results of a three-year study of the complete life cycle of this fungus are described. In cross inoculation experiments with the basidiospores *R. pallasii*, *R. cathartica* [ibid., 29, p. 149], *R. dahuricus* [ibid., 23, p. 501], and *R. oleoides* were all infected, but not *R. frangula* [ibid., 29, p. 149]. The aecidiospores from *Rhamnus* attacked oats strongly.

McKeen (W. E.). **Seedling susceptibility of dent Corn inbreds to rootrot caused by Pythium arrhenomanes.**—*Sci. Agric.*, 31, 11, pp. 475–479, 4 pl., 1951.

In experiments at the Dominion Laboratory of Plant Pathology, Harrow, Ontario, 28 inbred lines of dent maize were tested for their relative resistance to *Pythium arrhenomanes* [*R.A.M.*, 31, p. 60]. Thiram-treated seeds were sown in naturally and artificially infested soils, maintained at 18° to 20° C. and illuminated with daylight fluorescent lamps. Comparison of green plant weight and root examinations showed that most of the inbreds, in both types of soil, were completely susceptible; R4 was resistant and some others were semi-resistant. Factors governing the resistance to *P. arrhenomanes* and to *Gibberella zeae* [loc. cit.] were found to be different, R4 being susceptible to the latter while LC19, susceptible to the former, proved only partially resistant to the latter.

Planting hybrids, the vigour of which gives them the capacity to produce many new roots, or naturally resistant inbreds, such as R4, secures best control of *Pythium* root rot.

Perret (J.-E.) & Lespes (L.). **Quelques essais sur les moyens de protection contre la moisissure des Agrumes.** [Some experiments on means of protecting Citrus fruits from mould.]—Foire des agrumes nord-marocain du 12 au 20 février 1949, Port-Lyautey, pp. 45–58, ? 1949. [Received January, 1952.]

Extensive laboratory experiments were carried out at Rabat and Port-Lyautey, North Morocco, on the control of [unspecified] citrus moulds with various compounds in comparison with borax [*R.A.M.* 30, p. 454]. The fruit was examined

after treatment every week for four weeks and assigned a number varying from 20 (healthy) to 0 (completely covered with spores). In general the amount of decay increased in proportion to the length of time elapsing between harvesting and treatment, borax and orthoxyquinoline products giving the best results when applied two days after harvesting. Of the borax treatments, soaking for five minutes in 5 per cent. boric acid at 45° C. gave the best protection of wounded fruit. By far the best control was obtained by soaking for five minutes in cold 5 per cent. thiourea [loc. cit.] on the day of picking or two days later; wounded fruit remained almost intact (16 to 18 out of 20) to the end of the fourth week in all tests and sometimes kept for four weeks after a five-second dip.

In a preliminary practical trial one case of oranges was treated for 1½ minutes with 7 per cent. borax at 35°, two with cold 0·02 per cent. sodium chlorite for the same time, and one given no treatment before being dispatched to Versailles. The respective average mould percentages on arrival were 14·6, 35·5, and 21·8. In a second test the fruit was treated and packed at Port-Lyautey, kept for four days, and sent on a 1,224 km. journey before being stored in a cool, damp cellar in which green mould [*Penicillium digitatum*: loc. cit.; ibid., 30, p. 113, and next abstract] was rife. At the end of the first week of storage the percentage of rotted fruit treated with sodium chlorite was 2·6, cryptonol [ibid., 30, p. 414] 1·9, salicylanilide [ibid., 26, p. 252] 2·7, thiourea 0·5, and untreated 3·1, the corresponding figures for the second week being 11, 9·3, 4·7, 2·1, and 8·4, after which moulding increased considerably.

Lauriol (Mlle F.). **Quelques aspects de la lutte contre les Penicillium des Agrumes.** [Some aspects of the control of *Penicillium* on Citrus.]—*Fruits d'outre mer*, 6, 10, pp. 412–420, 1 fig., 7 graphs, 1951.

The author describes her own experiments at the Institute of Colonial Fruits and Citrus [Paris], the results of which agree in the main with those obtained by other workers, reviewed herein, on the control by mechanical, physical, and chemical means of citrus rotting caused by *Penicillium digitatum* and *P. italicum* [cf. preceding abstract]. She concludes that complete control can be secured only by the simultaneous employment of all the effective methods from the time the fruit is harvested up to the time it reaches the consumer. Low temperatures combined with low relative humidity reduce mould development during transport and storage on fruits subject to infection, while chemical treatment [loc. cit.], judiciously applied, gives added protection which may in time be complete.

Bitancourt (A. A.) & Rossetti (Victoria). **Stimulation of growth of Phytophthora citrophthora by a gas produced by Mucor spinosus.**—*Science*, 113, 2940, p. 531, 1951.

At the Biological Institute, São Paulo, Brazil, the contamination by *Mucor spinosus* of a large Petri dish containing several colonies of *Phytophthora citrophthora* [*R.A.M.*, 31, p. 380] stimulated the growth in diameter of the latter. The approximately equal diameter of all the colonies in the contaminated dish, together with the results of several controlled experiments using *P. citrophthora* cultures with and without *M. spinosus*, indicated that the stimulant was an unidentified gas produced by *M. spinosus*. Further experiments are being conducted to determine the nature of the gas, which is probably not ethylene, its effect on other micro-organisms, and its production by other plants.

Castellani (E.). **Brevi notizie sulla 'tristeza' degli Agrumi.** [Brief notes on 'tristeza' of Citrus.]—*Riv. Agric. subtrop.*, 45, 10–12, pp. 365–372, 2 figs., 1951. [English summary.]

Following a recent visit to Brazil the author reviews and discusses the present state of knowledge concerning tristeza disease of citrus [*R.A.M.*, 31, p. 382 and

next abstract], describing the development of the disease and the symptoms on sweet orange grafted on sour orange, and showing by means of a key the reactions of various stock-scion combinations to the condition. A list of 23 references is appended.

Chapot (H.). **Les viroses des Agrumes en Afrique du Nord.** [Viroses of Citrus in North Africa.]—*Fruits d'outre mer*, 6, 11, pp. 477–479, 3 figs., 1951.

After noting the geographical distribution of citrus quick decline [*R.A.M.*, 31, p. 62] and related conditions, including tristeza [see preceding abstract], the author states that quick decline does not exist in the Mediterranean Basin and has never been observed in Morocco or Algeria [cf. ibid., 30, p. 365]. Psorosis, however, is present in nearly every commercial citrus orchard in North Africa [loc. cit.; ibid., 31, p. 63].

Calavan (E. C.), White (F. A.), Schneider (H.), & Wallace (J. M.). **Collapse and decline of Lemon trees.**—*Calif. Citrogr.*, 37, 2, pp. 46–47, 63–64, 66, 4 figs., 1951.

Details are given of the economic importance and symptoms of decline and collapse of lemon trees [*R.A.M.*, 29, p. 257; 31, p. 281, and next abstract], which has become increasingly prevalent in southern California during the past 25 years. Pathological studies and the effect of different scion-rootstock combinations are described. The conditions discussed particularly are both associated with a characteristic pattern of sieve-tube necrosis [ibid., 28, p. 563], the cause of which is unknown. About 2,700 collapsed trees on 103 properties have been reported since 1935. The tendency of lemon trees to decline on certain rootstocks is bud-perpetuated. Affected trees which survive often pass through a cycle of recovery and further decline lasting from one to three years. Pruning is the only practical method known for combating collapse in existing orchards but its value is limited. Trees of nucellular Eureka lines seem less susceptible than the old strains, even though several of them show sieve-tube necrosis. Greater use of propagative material from vigorous, long-lived trees is encouraged.

Calavan (E. C.) & Wallace (J. M.). **Lemon tree collapse not caused by the quick-decline virus.**—*Plant Dis. Reptr*, 36, 3, pp. 101–102, 1952. [Multilithed.]

To determine whether lemon tree collapse in California [see preceding abstract] might be caused by the same virus as quick decline of orange trees [*R.A.M.*, 31, p. 228], buds and spur buds from six sources of lemon tree collapse and three of slowly declining lemon trees were grafted to young orange trees on sour orange rootstocks (highly susceptible to quick decline) in April and May, 1948. In 45 months none of the trees showed symptoms of quick decline. Citrus psorosis virus [ibid., 30, p. 34] was transmitted from two of the collapsed lemon sources but does not appear to be a factor in their collapse. Young and mature lemon trees were also budded, but only psorosis was transmitted. In test plots at Baldwin Park no symptoms developed in 30 months on orange trees grafted with buds from a collapsed lemon tree, though symptoms of quick decline appeared in ten months on similar test trees inoculated from quick decline sources. Other inoculations indicated that the Eureka lemon can be a symptomless carrier of the quick decline virus. The primary cause of lemon tree collapse has not yet been determined; that it is of virus origin would appear to be highly doubtful.

Bird (L. S.) & Blank (L. M.). **Breeding strains of Cotton resistant to bacterial blight.**—*Bull. Tex. agric. Exp. Sta.* 736, 25 pp., 8 figs., 1 diag., 1951.

The authors describe the methods used at the Texas Agricultural Experiment Station in developing strains of cotton resistant to bacterial blight (*Xanthomonas malvacearum*) [*R.A.M.*, 31, p. 282 and next abstract] and report studies carried out in connexion with the breeding programme. The resistance of Stoneville 20 [see

above, p. 422] is being combined with the desirable agronomic qualities of several other varieties. No evidence was obtained that there are different strains or races of *X. malvacearum*, and no isolate was able to break down the resistance of Stoneville 20. Using a method of disease grading based on the degree of leaf infection ten days after full symptoms had appeared on known susceptible varieties, the grade being determined in all cases by the leaf showing the most infection, Deltapine [cf. ibid., 19, p. 702; 21, p. 450] was found to be more tolerant than Stoneville 2B [ibid., 30, p. 519], which in turn was more tolerant than Acala [ibid., 23, p. 299; 28, p. 573].

Data obtained from crosses indicated that minor genes markedly influence the degree of resistance imparted by the major genes.

Brinkerhoff (L. A.), Green (J. M.), Hunter (R.), & Fink (G.). **Frequency of bacterial blight-resistant plants in twenty Cotton varieties.**—*Phytopathology*, 42, 2, pp. 98–100, 1 fig., 1952.

At the Oklahoma Agricultural Experiment Station relatively large populations of 20 United States cotton varieties were inoculated with *Xanthomonas malvacearum* and examined three to four weeks later for resistant and tolerant plants [*R.A.M.*, 31, pp. 184, 327, and preceding abstract]. Resistant individuals were encountered in CA 122, Stormproof No. 1, Mebane 6801, Northern Star, CA 119, Lankart 57, Lockett 140, Half and Half, Hibred, and Stoneville 62–1. Some plants of Deltapine 15, Stoneville 2B, and Arkot No. 1 were tolerant but not resistant. The number of resistant or resistant and tolerant plants in any one variety ranged from one to 96 (in Stormproof No. 1). The varieties containing the largest numbers of resistant plants originated in Texas or Oklahoma.

Heim (R.). **Les Termitomyces du Congo belge recueillis par Madame M. Goossens-Fontana.** [The *Termitomyces* of the Belgian Congo collected by Madame M. Goossens-Fontana.]—*Bull. Jard. bot. Brux.*, 21, 3–4, pp. 206–222, 2 col. pl., 4 figs., 1951.

Descriptive notes (with a key to the African species of the genus) are given on six species of *Termitomyces*, including *T. globulus* Heim & Goossens n.sp., collected from a termite nest in the Belgian Congo [*R.A.M.*, 30, p. 466].

Sackston (W. E.) & Carson (R. B.). **Effect of pasmo disease of Flax on the yield and quality of linseed oil.**—*Canad. J. Bot.*, 29, 4, pp. 339–351, 4 graphs, 1951.

Heavy, artificially induced infections of pasmo disease (*Septoria linicola*) [*Sphaerella linorum*] significantly reduced the seed yield and oil content of flax seed and the iodine number of the oil [cf. *R.A.M.*, 24, p. 451] in the varieties Crystal, Viking, Royal, and Redwing at Winnipeg and Morden, Western Canada [ibid., 30, p. 229] from 1945 to 1947. The effect was comparable with that caused by a hot, dry climate, and oil content reduction is similar to that reported for flax rust infection [*Melampsora lini*: ibid., 23, p. 342], though the effect on iodine number was different for the two diseases. Greatest reductions in oil content and iodine number resulted from pasmo inoculations (spraying with a spore suspension) made when the plants were in flower. Inoculations when the seed was ripening had little or no effect on the yield and oil quality.

Godoy (E. F.) & Bruni (O.). **Ciclo evolutivo de las royas del Lino (Melampsora lini) y del Maíz (Puccinia sorghi) en la Argentina.** [Life-cycle of the rusts of Flax (*Melampsora lini*) and Maize (*Puccinia sorghi*) in Argentina.]—*Rev. argent. Agron.*, 10, 1, pp. 21–34, 4 figs., 1952.

Melampsora lini cannot survive in the uredo stage the high summer temperatures prevailing in the Pergamino district of Buenos Aires [*R.A.M.*, 30, p. 320], but

infective material for young flax plants is provided by the teleutosori on the straw of the preceding season's crop. The pycnia and aecidia produced in the autumn give rise to primary infections. Doubtless a similar cycle is followed in other regions of Argentina with comparable ecological conditions. The rarity of epiphytotics of flax rust in such regions may well be attributable to the scarcity of teleutosori sometimes observed on linseed varieties.

Puccinia sorghi, the agent of maize rust [ibid., 25, p. 260], persists by means of pycnia and aecidia formed on *Oxalis corniculatus*. The teleutospores of both rusts germinate after a resting period of four to five months.

James (M. O.) & Plakidas (A. G.). **Two new Phytophthora diseases of ornamental Hibiscus.**—*Phytopathology*, 42, 3, pp. 144–146, 2 figs., 1952.

Hibiscus rosa-sinensis and *H. schizopetalus* have sustained heavy damage of recent years in Louisiana and other southern States from a foot rot and a leaf and stem blight. The agent of the former disease was named in a preliminary report *Phytophthora cactorum* var. *applanata* [*R.A.M.*, 30, p. 417], while that of the latter is identified as *P. palmivora* [cf. ibid., 27, p. 172]. This is apparently the first report of *Phytophthora* spp. on these hosts. The leaf and stem blight occurred on heavily syringed plants in the propagation bed during the process of air-layering. Dark, watersoaked areas, originating round the sphagnum wraps, spread rapidly over the stems and foliage, killing the plants in a very short time. Infestation of the soil, whether autoclaved or not, was the most successful of the various methods of inoculation tested with both species, symptoms of foot rot and leaf blight appearing within five to six days.

Virus-free Dahlias.—*Fruit Gr., 1952*, 2950, p. 69, 1952.

During a visit to Alexander Lister and Sons, Rothesay, and T. Imrie and Sons, Ayr Nurseries, Scotland, where post-war research and practical work on virus-free dahlia stocks [cf. *R.A.M.*, 27, p. 187; 31, p. 121] have been carried out, it was stated that the virus content of the stocks under control has been less than one per cent. for some years.

Newton (N.) & Rosberg (D. W.). **Electron-microscope studies of a new Orchid virus complex.**—*Phytopathology*, 42, 2, pp. 79–82, 2 figs., 2 graphs, 1952.

The first report of the authors' electron-microscope studies at the Battelle Memorial Institute, Columbia, Ohio, on a virus complex causing mottle of the leaves and petioles of *Cattleya* orchids [cf. *R.A.M.*, 30, p. 610] was published in *J. appl. Phys.*, 21, p. 70, 1950. Centrifugally purified material from diseased plants contained two morphologically distinct types of rod-like particles, one straight, 300 by 24 mμ, and the other sinuous, 390 by 21 mμ. No such forms were detected in externally normal seedlings, and the particles are believed to represent the infective principles of a new virus complex. Concentrated suspensions of extracts from mottled plants showed marked streaming birefringence in the polarizing microscope, a feature that was absent from extracts of normal orchids. Infected material but not the healthy further showed a pronounced Tyndall cone. Precipitin ring tests with rabbit serum were positive, the reaction being extinguished at a dilution of 1:30 of antigen from mottled stock. The extinction points in reactions with healthy extracts occurred at 1:5 and 1:10 dilutions.

Ferguson (J.). **Powdery mildew of Begonia.**—*Begonian*, 18, 11, p. 245, 1951.

Powdery mildew of begonias caused by *Oidium* sp. [*O. begoniae*: *R.A.M.*, 31, pp. 123, 329] was reported from Santa Barbara to San Diego, California, during 1951. Limited tests indicated the effective control given by two applications, a

week apart, of 3 oz. iscothan in 100 gals. water plus 5 oz. spreader (Du Pont sticker-spreader or triton B1956). The need for complete coverage is emphasized.

MAGIE (R. O.). **Limitations of resistance to Gladiolus Fusarium disease.**—*Gladiol. Mag.*, 15, 4, pp. 2, 36–38, 1951.

Some of the most resistant gladiolus varieties, such as Maid of Orleans, Margaret Fulton, and Elizabeth the Queen, occasionally develop *Fusarium* corm rot (*F. oxysporum* [f. *gladioli*: *R.A.M.*, 31, p. 119]). Moreover, the roots or leaf bases are often susceptible to infection when the corm is resistant. In warmer areas new stock may be considered healthy if no disease appears either in the field or in storage after growing in a limited area for two or three years.

[This information appeared under the title 'What resistance to *Fusarium* disease means', in *Bull. N.Amer. Gladiol. Coun.*, *1951*, pp. 6–8, 1951.]

BRIDGMON (G. H.) & WALKER (J. C.). **Gladiolus as a virus reservoir.**—*Phytopathology*, 42, 2, pp. 65–70, 2 figs., 1952.

During the summers of 1948 and 1949 garden plantings of bean (*Phaseolus vulgaris*) in Wisconsin sustained heavy damage from a disease characterized by severe top necrosis, stunting, and killing. These symptoms being typical of bean yellow mosaic virus, of which *Gladiolus* is a carrier [*R.A.M.*, 31, p. 385], local plantings of the ornamental were examined for possible sources of viruses pathogenic to bean.

Two viruses were isolated and identified on the basis of host range, symptoms, physical properties, and cross-protection tests as a strain of cucumber virus 1 [cucumber mosaic virus: loc. cit.] and tobacco ring spot [loc. cit.]. In inoculation experiments on 22 species of plants with the *Gladiolus* isolate and the green strain of tobacco ring spot virus positive results were obtained on spinach, cucumber, melons and other cucurbits, *Zinnia*, maize, soy-bean (which developed bud blight symptoms [ibid., 25, p. 484]), tobacco, *Nicotiana glutinosa*, and jimsonweed [*Datura stramonium*]. Maize is a new host of tobacco ring spot virus, plants inoculated with the green strain at 24° to 28° C. contracting apical necrosis and streaking of the youngest leaf. The symptoms induced by yellow tobacco ring spot were similar but more severe. At 20° the plants displayed mild mottle and long, narrow, transparent streaks. A close correlation was observed between *Gladiolus* plants harbouring either or both ring spot and cucumber mosaic viruses and those with typical white break symptoms (abs. in *Phytopathology*, 41, p. 5, 1951) [ibid., 31, p. 319]. Dormant corms of plants exhibiting these symptoms in the previous year failed to yield the viruses, but isolations from the first young leaves were successful.

Bean yellow mosaic virus was also found to occur naturally in *Gladiolus*, several isolates from which appeared to belong to the pod-distorting strain [*R.A.M.*, 29, p. 284].

ANDERSON (C. W.). **Additional notations on the red leaf virus of Filaree.**—*Phytopathology*, 42, 2, pp. 110–111, 2 figs., 1952.

At the Florida Agricultural Experiment Station the red leaf virus of filaree (*Erodium* spp.) [*R.A.M.*, 31, p. 19] was recovered from all the plants listed as susceptible by Frazier [ibid., 30, p. 471], with the addition of *Geranium molle*. Tests on *E. chamaedryoides* and its var. *roseum* showed this species to be susceptible, but attempts to reisolate the virus failed. Besides the symptoms described by Frazier [loc. cit.] the author observed a conspicuous dark green veinbanding visible from the abaxial side of leaves held against the light. *E. chamaedryoides* and its var. *roseum* are free from the marginal reddening typical of all other hosts of the virus. Judging by the freedom from red leaf of 147 *E. moschatum* seedlings from

plants inoculated about the time of flowering, the virus is seldom or never transmitted in this way.

[Beet] curly top [ibid., 14, p. 171] and western cucumber mosaic [ibid., 31, p. 34] viruses may be differentiated from red leaf on *E. moschatum* primarily by the absence of veinbanding or marginal reddening. Red leaf is distinguishable from most other viruses by being persistent and non-sap-transmissible, while host range and vector differences separate it from the rest of the persistent aphid-borne viruses.

Gasc Daireaux (A.). **El control del 'damping off' en Alfalfa por medio de funguicidas.** [The control of 'damping-off' in Alfalfa by means of fungicides.]—*Rev. Bolsa Cereales, 1951*, pp. 7–35, 1951. [Abs. in *Herb. Abstr.*, 22, 2, p. 105, 1952.]

In trials on the control of damping-off of autumn- and spring-sown lucerne [*R.A.M.*, 30, p. 273] in Argentina caused by *Fusarium*, *Pythium*, and *Rhizoctonia* spp. granosan 1 and 5 and uspulun gave significant control, but when the degree of infection was high no material was effective.

Hodgson (H. J.) & Coe (D. M.). **Bacterial wilt of Alfalfa in Alaska.**—*Plant Dis. Reptr*, 36, 3, p. 116, 1952. [Multilithed.]

During the summer of 1952 [? 1951] *Medicago falcata* plants in the Matanuska Valley, Alaska, were found to be affected by lucerne bacterial wilt (*Corynebacterium insidiosum*) [*R.A.M.*, 30, p. 217; 31, p. 50; C.M.I. map No. 67]. This appears to be the most northerly record of the disease so far.

Donald (C. M.) & Spencer (D.). **The control of molybdenum deficiency in subterranean Clover by pre-soaking the seed in sodium molybdate solution.**—*Aust. J. agric. Res.*, 2, 3, pp. 295–301, 3 graphs, 1951.

In pot studies at Canberra in which subterranean clover [*Trifolium subterraneum*] was grown in soil deficient in molybdenum [*R.A.M.*, 29, p. 623; 31, p. 104], pre-soaking the seed for 20 hours in 0·1 per cent. sodium molybdate was fully effective in promoting normal growth; soil and seed treatments gave equivalent yield responses at all levels of application tested. At levels in excess of the requirements for maximum yield pre-soaking gave higher molybdenum and higher nitrogen (at all levels) contents of the tops than did equivalent soil applications.

Thirumalachar (M. J.) & Whitehead (M. D.). **Sporangial phase of Sclerospora butleri.**—*Amer. J. Bot.*, 39, 6, pp. 416–418, 8 figs., 1952.

Eragrostis plumosa plants growing in a marshy situation near Bangalore, India, were severely attacked by *Sclerospora butleri* [*R.A.M.*, 12, p. 766], which produced sporangia, not previously described, on simple, unbranched, pedicel-like hyphal cells protruding from hyphae grouped beneath the stomata. The hyphal cell was obconical, narrow at the base, and measured up to 22 by 12 μ; six to eight sporangia on short sterigmata formed at the apex. No sporangia were observed on the dorsal leaf surface and production appeared to occur only nocturnally. Mature sporangia were lemon-shaped, hyaline, and with granular contents, and measured 28 to 34 by 15·5 to 22 μ. They produced four or rarely eight oblong-ellipsoid zoospores measuring 11 by 8 μ.

In view of these observations the authors transfer the fungus to *Basidiophora* [cf. ibid., 28, p. 545] as *B. butleri* n. comb.

Hamilton (J. M.) & Palmiter (D. H.). **Orchard tests for Apple scab control in New York State : I. Sulphur fungicides.**—*Bull. N.Y. St. agric. Exp. Sta.* 747, 63 pp., 1 fig., 1951.

Most of the information in this article on the results of 10 years' orchard testing of fungicides for the control of apple scab [*Venturia inaequalis*: *R.A.M.*, 30, p. 25;

31, p. 189] in New York State has already been noticed from other sources [ibid., 22, p. 486; 23, p. 443; 29, p. 498]. During 15 years, infection on McIntosh in the Hudson Valley occurred in six seasons at the green tip to delayed dormant stage, in five during the pre-pink or pink stages, and in four, as the result of a dry spring, at the bloom or calyx stage. The period from the end of April through May and June was the most critical for primary scab infection, 6th April being the earliest date of ascospore discharge and 10th June of complete discharge. Eight fungicide applications were sufficient for control in orchards having abundant inoculum in years favourable for disease development. Magnetic '70' sulphur paste [ibid., 27, p. 510], the most retentive of all the wettable sulphurs, proved as effective against scab as lime-sulphur; micronized sulphur gave a consistent performance and was nearly as effective as the paste types. A minimum concentration of 4 to 5 lb. sulphur per 100 gals. was required for complete control. The effectiveness of wettable sulphurs was improved by orthex when applied during rain periods; hydrated spray lime increased their rate of setting and retention.

Coposil and fermate are suggested as substitutes in the spray programme to control certain other diseases and to avoid high temperature damage or injury when certain insecticides, incompatible with sulphur, are used.

Croxall (H. E.), Collingwood (C. A.), & Jenkins (J. E. E.). **Observations on brown rot (Sclerotinia fructigena) of Apples in relation to injury caused by Earwigs (Forficula auricularia).**—*Ann. appl. Biol.*, 38, 4, pp. 833–843, 1 pl., 6 graphs, 1951.

Observations on Cox's Orange Pippin and Laxton's Superb apple trees in orchards in the West Midlands from 1947 to 1950 showed that brown rot (*Sclerotinia fructigena*) [cf. *R.A.M.*, 31, p. 191 and next abstract] was frequently associated with shallow holes in the fruit, a type of injury which, as demonstrated by laboratory experiments with undamaged apples, could be caused by earwigs. Strips of sacking soaked in BHC and placed round trunks of Laxton's Superb trees in 1949 and from June until the end of the season in 1950 trapped large numbers of earwigs, and less infection occurred on these trees than on those without traps (2·15 and 7 per cent. infected apples, respectively, in 1950). Satisfactory earwig control was given by 3 per cent. BHC applied to the traps at intervals of three weeks. A survey of picked fruit in 1950 demonstrated a close correlation between degree of earwig injury and amount of brown rot, and such damage on fruit, appreciable in 10 of 13 grass orchards, was negligible in nine arable plantations.

Ribaldi (M.). **Influenza della temperatura sullo sviluppo della Monilia fructigena Pers. su frutti di Mela.** [Influence of temperature on the development of *Monilia fructigena* Pers. on Apple fruits.]—Reprinted from *Riv. Ecol.*, 1, 5–6, 11 pp., 7 pl., 1 graph, 1950. [English summary. Received February, 1952.]

In studies carried out at the Institute of Plant Pathology, University of Perugia, from November, 1949, to March, 1950, healthy Abbondanza apples were wounded at four points, inoculated at laboratory temperature with conidia of *Monilia* [*Sclerotinia*] *fructigena* [see preceding abstract], and placed two days later in closed containers kept at −6° to 38° C. [cf. *R.A.M.*, 12, p. 702; 16, p. 759; 21, p. 27; 31, p. 49], the humidity inside the containers being maintained at 95 to 98 per cent.

Three typical forms of vegetation and fructification were recognized: 'cespituli miceliari', or mycelial tufts, composed of compact plectenchymatous mycelium surmounted by compact vertical hyphae; compact, cushion-like organs of fructification, 'pulvinuli' or 'conidia-bearing pulvinuli', having a base similar to the preceding but covered with a conidial layer; and intermediate forms, termed 'cespituli conidiferi' or 'conidia-bearing tufts'. Each form was favoured by certain temperatures as follows, but not to the exclusion of the other forms.

Twenty days after inoculation the apples kept (for 20 days) at −6° to 5° bore greatly enlarged chestnut-coloured spots with no outward sign of fungal growth or fructification. Those kept at 6° to 11° were completely brown and thickly covered with micro- and macro-mycelial tufts (the micro 400 to 1,000 μ and the macro 1,500 to 7,500 μ); in many instances they covered the entire surface. At 12° to 25° the brown surface was thickly covered with micro- and macro-conidial tufts; at 26° to 30° it was covered with mycelial micro tufts which often formed an adherent, woolly layer; while at 31° to 35° the brown surface bore a slight, whitish growth at the site of inoculation.

When apples bearing pulvinuli developed at 16° to 18° were transferred to 0° to 4° the pulvinuli remained unaltered; at 7° to 11° they were nearly all changed into mycelial tufts; at 12° to 16° and 20° to 25° they were all changed into conidia-bearing tufts; and at 30° to 35° they dried up. If maintained continuously at 16° to 18°, they became slowly transformed into conidia-bearing tufts.

The ideal temperature for the growth of *S. fructigena* in living apple tissues appears to lie between 13° and 26°, the optimum being between 22° and 25°.

Darpoux (H.). **Les chancres des arbres fruitiers. I. Le chancre européen du Pommier. II. Le chancre du Châtaignier.** [The cankers of fruit trees. I. European canker of Apple. II. Chestnut canker.]—*Déf. Vég., Paris, 1951*, 6, pp. 3–15, 5 figs., 1951.

Notes are given on the economic importance, history, geographical distribution, symptoms, biology, dissemination, and control of apple canker caused by *Nectria galligena* [*R.A.M.*, 31, pp. 126, 373] and chestnut canker (*Endothia parasitica*) [see below, p. 463], together with factors favouring development, host range, and varietal reaction.

Woodbridge (C. G.) & McLarty (H. R.). **Manganese deficiency in Peach and Apple in British Columbia.**—*Sci. Agric.*, 31, 10, pp. 435–438, 1 pl., 1951.

Foliage symptoms, characteristic of moderate manganese deficiency, were observed on peach [*R.A.M.*, 17, p. 49; 25, pp. 2, 120], apple [ibid., 30, pp. 16, 166], and apricot [ibid., 22, p. 252] in the Okanagan area of British Columbia. One spray of manganese sulphate solution at 2 lb. per 100 gals. effected complete recovery on peach in one month. The manganese content of normal apple and peach leaves averaged 86·8 and 40·9 p.p.m., respectively, and of affected leaves, 10·8 and 9·3 p.p.m., respectively.

Lovisolo (O.). **Attacchi di 'Monilia fructigena' Pers. e di 'Monilia laxa' Ehr. sui frutti di Nocciuolo.** [Attacks of *Monilia fructigena* Pers. and *Monilia laxa* Ehr. on fruits of Hazel Nut.]—Reprinted from *Atti Accad. Torino*, 85, (*1950–1951*), 7 pp., 2 figs., 1951. [French summary.]

In June, 1950, hazel-nuts (*Corylus avellana*) growing in different parts of Piedmont, Italy, became infected by *Monilia* [*Sclerotinia*] *fructigena* [cf. *R.A.M.*, 25, p. 400; 30, p. 204], not previously recorded on this host in Italy. Infection caused a brown discoloration and withering of the shell and husk, and was generally followed by fruit drop. In one instance *M.* [*S.*] *laxa* was isolated from an affected nut.

Bolton (A. T.) & Racicot (H. N.). **Cultural and inoculation studies on Elsinoe veneta, the causal organism of anthracnose of Raspberry.**—Reprinted from *Rep. Quebec Soc. Prot. Pl., 1950*, 7 pp., 3 pl., [? 1951.]

These cultural studies at Ottawa on *Elsinoe veneta* [cf. *R.A.M.*, 31, p. 69] have already been noticed from another source [ibid., 31, p. 51].

CADMAN (C. H.). **Studies in Rubus virus diseases. I. A latent virus of Norfolk Giant Raspberry.**—*Ann. appl. Biol.*, 38, 4, pp. 801–811, 1 pl., 1951.

In studies at University College, Dundee, on a suspected virus disease of the L 234 selection of Norfolk Giant raspberry, previously assumed to be virus-free [*R.A.M.*, 28, p. 509], graft transmission experiments were carried out from 1947 to 1950 on a number of *Rubus* species and commercial raspberry varieties. The topmost portions of young, growing canes (4 to 8 in. long) were used as scions and inarch grafted to young canes on the potted stock plants, the cut end of the scion being kept submerged in water in a glass tube wired to the supporting stake until stock and scion united, 14 to 20 days later. Rapid development of symptoms was induced by pinching out the growing point of the grafted cane eight to ten days after grafting and encouraging the development of side shoots immediately below the union. Under cool, well-ventilated glasshouse conditions this 'bottle' method of grafting proved highly successful. It is a rapid, certain, economical method, which can be used over the entire growing season.

The results obtained demonstrated that the L 234 selection of Norfolk Giant behaves as a symptomless carrier of a virus, for which the name 'leaf mottle' [ibid., 31, p. 192] is proposed. It causes mosaic symptoms on *R. saxatilis*, the American black raspberry (*R. occidentalis* var. Cumberland), and the red raspberry varieties Chartham and St. Walfried. The number of plants sampled warrants the conclusion that the entire L 234 selection is infected. It is inferred that Baumforth's Seedling B is also a symptomless carrier of this virus, which is present in some commercial stocks of Burnetholm Seedling, and the Malling varieties Enterprise, Notable, and Promise.

The aphid *Amphorophora rubi* [ibid., 31, p. 288] transmitted the leaf mottle virus to *R. saxatilis* and *R. occidentalis* var. Cumberland after feeding periods on Norfolk Giant L 234 of half-an-hour or more. It rarely persists in the vector for more than four hours.

WADE (G. C.). **White root rot of Raspberries.**—*Aust. J. sci. Res.*, Ser. B, 4, 3, pp. 211–222, 1 pl., 1 fig., 1951.

A disease known to raspberry-growers as white root rot has been present in Victoria for nearly fifty years, having been described first by McAlpine in 1897. The disease is widespread throughout the commercial raspberry growing region, which is now practically confined to a relatively small area east of the Dandenong Ranges. In some plantations it has spread rapidly, a few having been practically wiped out in three or four years, but usually only a few bushes are killed annually. In January, 1950, it was reported from a plantation in the Molesworth district of Tasmania, but no further cases came to light.

Investigations made from 1941 to 1947 at the Department of Agriculture, Victoria, showed that the roots and cane bases rot below ground level and are covered with a dense, predominantly white mycelial mat. Conspicuous white rhizomorphs develop on the surface of the affected areas. The plant is not attacked by the fungus above ground-level although the leaves usually turn yellow, accompanied by premature autumn tints, and the affected parts wilt rapidly and die. Wilting and death may occur without any preliminary symptoms. When young plants are attacked the whole bush dies simultaneously, but old bushes die gradually, a few canes at a time.

Pathogenicity tests established that the disease was caused by a white fungus, sterile both in the field and on artificial media and requiring a food base, such as raspberry cane in the soil, to establish infection. It is favoured by dry soil conditions and high soil temperatures (28° C.), and is spread from one plantation to another by the planting of infected canes and within a plantation by root contact

and movement of infected material. The known natural host range includes raspberry, loganberry, and plum. *Rosa multiflora*, *R. noya*, apple, pear, cherry, and blackberry were infected artificially, but in all cases infection was arrested.

Virus, virus—everywhere!—*Fruit Gr.*, *1952*, 2950, p. 62, 1952.

In an address made at East Malling Research Station A. F. Posnette reported that the Climax strawberry variety is affected by a disease, 'green petal', which in certain respects resembles a virus disease, though it has not yet been experimentally transmitted. Affected plants have a harsh foliage and the flower petals are small and green. The fruit is small, or of a fair size but seedy, and the plants seldom survive for more than one year.

G. H. L. Dicker stated that insecticides containing the systemic 'schradan' (24 fluid oz. per 100 gals.) had virtually eliminated the strawberry aphid [*Capitophorus fragariae*: see next abstract], responsible for the spread of the strawberry virus diseases crinkle and yellow edge. Hand lances should be used for the application, since it is important to cover the old leaves at the base of the plant. On maiden beds, if the plants are nicotine-dipped before planting, the same spray would be more effective applied after the migration than just before the insects appear. Graphs show clearly that plants over one year old should be sprayed before the winged forms appear, while maiden plants should be treated at the beginning of July to prevent autumn spread of the virus. Treated plants showed 0 to 20 per cent. infestation, as against 100 per cent. for the untreated.

According to A. F. Posnette it has been proved that viruses cause 10 per cent. stunting per annum in top fruit trees. At least three strains of apple mosaic virus [*R.A.M.*, 30, p. 330] have been found; there is evidence that a mild strain immunizes trees against a severe strain, but as it might possibly degenerate into the severe strain it could not be used for immunization.

Miller (P. W.). **Relation of a fast period to the aphid transmission of the crinkle virus of Strawberry.**—*Plant Dis. Reptr*, 36, 3, pp. 92–93, 1952. [Multilithed.]

In an experiment carried out at Oregon Agricultural Experiment Station and United States Bureau of Plant Industry, Soils, and Agricultural Engineering, Corvallis, Oregon, aphids (*Capitophorus fragaefolii*) [*C. fragariae*: *R.A.M.*, 31, p. 390], which had not fasted before feeding for 30 minutes on an infected Marshall strawberry plant, did not transmit the strawberry crinkle virus [ibid., 30, p. 619; 31, p. 337] to *Fragaria vesca* indicators [see next abstracts]; others, which had fasted for three or 22 hours before an infection feeding period of the same duration, gave 63 and 55 per cent. transmissions, respectively. To give complete control of the virus an insecticide must kill an aphid before a 30-minute feeding period has elapsed [see preceding abstract].

Scott (D. H.), Ink (D. P.), Darrow (G. M.), & Marcus (C. P.). **Virus as a hazard in Strawberry breeding in eastern United States.**—*Plant Dis. Reptr*, 36, 3, pp. 89–91, 1952. [Multilithed.]

From 1947, seedling strawberry fields at the Plant Industry Station, Beltsville, Maryland, were isolated from other cultivated strawberries, except for part of the 1947 planting, and aphid (*Capitophorus* spp.) control was practised in the greenhouse on new seedlings and in field plantings. The results of indexing on *Fragaria vesca* [see preceding and next abstracts] show that spreads of virus (type 1) [cf. *R.A.M.*, 31, p. 288] into new selections has been greatly reduced, though isolation did not keep the plantings entirely virus-free. Dusting with parathion appeared to give more effective aphid control than spraying. On 1st December, 1951, 28 of 30 selections made before 1950, and all of 44 made before 1951 were virus-free.

In a search for virus-free material for breeding two different samples of plants of one clone of *F. virginiana* grown at Beltsville for ten years prior to 1948, part of the time under conditions known to favour virus infection, were ascertained to be virus-free. In 1950 15 potted, virus-free *F. virginiana* plants from indexed material were placed in a field severely infected with virus and heavily infested with aphids. After a month the eight plants still virus-free on indexing were grafted to virus-infected *F. vesca*, and about two months later they were indexed again to clean *F. vesca*; four showed no virus.

Miller (P. W.). **Technique for indexing Strawberries for viruses by grafting to Fragaria vesca.**—*Plant Dis. Reptr*, 36, 3, pp. 94–96, 3 figs., 1952. [Multilithed.]

The 'tongue' and approach methods of grafting strawberry plants to indicator plants to test for the presence of viruses [see preceding abstracts] are described, the former method being recommended if both runners are large in diameter, and the latter when one or both of them is relatively small. The highest percentages of positive grafts were obtained with succulent runners that had just completed their primary elongation and were beginning to unfold the primary leaves of the tip plants. Runners of both plants should be in a similar stage of development. Double grafting is essential in indexing strawberry varieties to be used as virus-free foundation stocks.

Powell (D.). **The effect of early spring fungicides on Botrytis cinerea.**—*Plant Dis. Reptr*, 36, 3, pp. 97–98, 1952. [Multilithed.]

In a spraying test against strawberry grey mould (*Botrytis cinerea*) [*R.A.M.*, 26, p. 205] carried out near Cobden, Illinois, a patch of three-year-old Robinson plants was sprayed on 23rd April on the first appearance of the flowers and again on 15th May, the whole floor of the area being sprayed. Application of orthocide 406 [ibid., 31, p. 284] and ferbam, both at 2 lb. per 100 gals. at the rate of 460 gals. per acre, resulted, respectively, in 6·6 and 4·8 per cent. infected fruit on 29th May, compared with 11·6 per cent. for the unsprayed. At Walnut Hill Blakemore strawberries were treated on 1st May (almost full bloom stage) and 6th May with ferbam at the above rate; on 8th May there were 10·9 per cent. infected fruit and 28·7 per cent. in the untreated. Three applications of either fungicide would probably give even better results.

New outlook on Strawberry root rots.—*Fruit Gr., 1952*, 2947, pp. 1137–1138, 1 fig., 1952.

In autumn, 1949, and spring, 1950, Climax strawberries were planted on ridged and flat land at the Botley Experimental Horticulture Station, Hampshire, some being manured and others not. The 1951 yield was significantly greater on the ridged than on the flat land, and the incidence of summer wilt [*R.A.M.*, 28, p. 528] was far less marked. The better growth was correlated with increased root fibre. Present indications are that poor root systems on dying strawberry plants in spring and early summer are not necessarily due to soil fungi, and that the encouragement of stronger root development is a sound line of approach to many strawberry problems.

Another red core [*Phytophthora fragariae*] varietal susceptibility trial [cf. ibid., 31, p. 70] in soil so heavily infested with the disease that many inter-varietal rows of Madame Lefebvre sustained 100 per cent. loss, demonstrated the vigour of C.1., a comparatively new variety giving good yields of well-flavoured, uniformly shaped, good quality fruit, but sensitive to [unspecified] viruses.

Fall (Joan). **Studies on fungus parasites of Strawberry leaves in Ontario.**—*Canad. J. Bot.*, 29, 4, pp. 299–315, 7 pl., 6 figs., 1951.

Field surveys and experiments were made in Ontario, Canada, during the 1948–9 strawberry growing season in order to study the symptomatology of four strawberry leaf diseases. Symptoms of leaf spot (*Mycosphaerella fragariae*) [*R.A.M.*, 30, pp. 15, 173], most prevalent in spring and autumn, leaf scorch (*Diplocarpon earliana*) [ibid., 3, pp. 588–9; 18, p. 191], in midsummer, and leaf blight (*Dendrophoma obscurans*) [ibid., 30, p. 308], in late summer and autumn, are sometimes so similar that diagnosis on this basis is difficult. All are prevalent on the varieties grown in the Ottawa area. Premier, grown mostly in the Clarkson-Niagara area, is fairly resistant to spot and scorch but highly susceptible to blight after the cropping period. Its replacement in many areas by Valentine, from the Vineland Horticultural Experiment Station, may increase the economic importance of leaf spot, to which the latter variety is susceptible.

Lesions produced by *M. fragariae* on *Fragaria nipponica* at first resembled oval drops of light brown paint over the bright green leaves. Dark borders were visible only in the very old lesions. Varietal resistance was striking among strawberries. In culture *M. fragariae* made no growth at 35° C. and little more than germ tube formation occurred at 30°; growth was optimum at 25° and still evident at 5°. Conidia failed to germinate below 98 per cent. relative humidity and were killed at 35°, germination being at a maximum at 15° and nearly as good at 20°. Spore production, occurring between 5° and 30°, was optimum at 20° to 25°. In greenhouse inoculation experiments penetration took place between 10° and 20°. Symptoms, observed within seven days and fully developed within 12 days, were expressed best at 20° to 25°, and only slightly at 15°. Middle-aged leaves were severely spotted, no spots occurring on the youngest and only occasional ones on the oldest leaves. Consistent high humidity delayed the development of the white centres of the lesions. Premier plants were readily infected under artificial conditions. Isolations of a leaf spot fungus from *Potentilla anserina* appeared identical with those of *M. fragariae*, but it did not attack strawberry. *P. monspeliensis* was readily infected by *M. fragariae* while *P. reptans* and *P. canadensis* were not.

Diplocarpon earliana causes pin-point and blotchy types of lesions on strawberry leaves, the blotches, measuring $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter, being usually more irregular than those caused by *Dendrophoma obscurans*; girdling lesions on the petioles may cause the death of the entire leaf. In spore germination studies of *Diplocarpon earliana* short germ tubes were produced in distilled water at 15°; at 20° and 25° they were three times as long, but shorter again at 30°. Some spores germinated at 35°. In distilled water, which had contained fresh leaf pieces, germ tubes were five to ten times the length of those in plain distilled water, and while very long tubes were formed between 20° and 30°, 25° to 30° seemed to be the optimum. In constant temperature chambers at 15°, 20°, and 25° symptoms appeared within seven to nine days, consisting of small chlorotic areas which later developed small purple centres and expanded as the centres enlarged. The oldest and middle-aged leaves were both attacked, lesions spreading more rapidly and fruiting occurring several days earlier in the former. The spreading type of lesion developed on Valentine and on *F. virginiana*, while a diffuse type, with the dark area extending in threads from the central point of infection, was formed on Premier and Senator Dunlop. Only the first stage of lesion development, a small black centre surrounded by a chlorotic band, appeared on *F. vesca*.

Young lesions caused by *Dendrophoma obscurans* are usually reddish purple, almost circular, and may either spread considerably or their centres may soon become dry and brown. Discoloration is most rapid along the veins, an elliptical lesion being formed with a vein as its main axis, often spreading out in a V-shape. The fungus has been found producing pycnidia during the entire summer and

apparently overwinters in that state or [as mycelium] in the leaf tissue. Wild *F. vesca* seemed particularly susceptible, the disease appearing more severe at 25° in that the lesions were more spreading.

The author proposes to raise var. *fructicola* of *Gnomonia fragariae* [ibid., 30, p. 308] to specific rank as *G. fructicola* (Arnaud) n.comb. Perithecia are carbonaceous, with globose bases 450 to 600 μ in diameter and necks 500 to 1,000 μ long. The asci are about 33 μ long with ascospores at first slightly curved and containing five to six vacuoles which disappear at maturity, the spores becoming unequally divided into two cells with a slight constriction at the septum, and measuring 10 to 12 by 2 to 3 μ. The fungus, which was not highly parasitic on strawberry leaves in infection experiments, grew well on potato dextrose agar, producing abundant pycnidia and perithecia.

D'Armini (M.). **Forte infezione di rogna in due oliveti colpiti da grandine.** [Severe infection of knot disease in two Olive groves injured by hail.]—Reprinted from *Ann. Fac. Agr. Perugia*, 7, 11 pp., 4 figs., 1950. [Received February, 1952.]

On 24th June, 1949, olive trees growing between Morra (Città di Castello) and Castiglion Fiorentino (Arezzo), Italy, were severely damaged by hail, and shortly afterwards became heavily infected by knot disease (*Pseudomonas savastanoi*) [*R.A.M.*, 30, p. 235; 31, p. 25]. At Morra the Olivella variety was more resistant than Borgione or Olivo dolce. At Castiglion Fiorentino, in February, 1950, the Raggia variety showed moderate, Moraiolo heavy, and Coreggiolo very heavy infection. The most severely affected trees were pollarded and the remainder pruned, all old and new tumours being removed and the wounds disinfected and tarred. In July, 1950, the trees were again severely infected. Trees sprayed with calcium cyanamide [ibid., 31, p. 278] were a deeper green than those sprayed with Bordeaux and appeared to bear fewer tumours.

Brun (J.). **L'anthracnose du Manguier en Guinée.** [Anthracnose of Mango in Guinea.]—*Fruits d'outre mer*, 6, 11, pp. 475–476, 2 figs., 1951.

Brief, popular notes are given on the symptoms, causal organism, geographical distribution, and control of mango anthracnose (*Glomerella cingulata*) [cf. *R.A.M.*, 30, p. 454]. The disease is very prevalent in the Ivory Coast and French Guinea.

Kittleson (A. R.). **A new class of organic fungicides.**—*Science*, 115, 2978, pp. 84–86, 1952.

In studies at the Esso Laboratories, Standard Oil Development Company, Linden, New Jersey, a series of new compounds has been synthesized by the reaction of perchloromethyl mercaptan with the alkali metal salts of imides and amides. In a co-operative testing programme with Rutgers University the compounds displayed unusual fungicidal activity, and one, SR 406 [orthocide: *R.A.M.*, 31, pp. 54, 441], offers particular promise as an agricultural fungicide. Sixteen compounds obtained by the reaction indicated above all had an LD50 value of under 10 p.p.m. against *Alternaria solani* [see below, p. 445] and *Sclerotinia fructicola* by the slide germination technique [ibid., 28, p. 471; 31, pp. 339, 388, and next abstract].

Rader (W. E.), Monroe (C. M.), & Whetstone (R. R.). **Tetrahydropyrimidine derivatives as potential foliage fungicides.**—*Science*, 115, 2979, pp. 124–125, 1952.

In studies at the Shell Agricultural Laboratory, Modesto, and the Shell Development Company, Emeryville, California, a group of derivatives of tetrahydropyrimidine proved to have high fungistatic value. Laboratory evaluations of 12 of these

compounds, using spores of *Alternaria circinans* [*A. brassicicola*: *R.A.M.*, 28, p. 248] and *Monilinia* [*Sclerotinia*] *fructicola* [see preceding abstract], showed that fungistatic effectiveness was strongly dependent on the nature of the substituent in the 2-position, maximum toxicity being reached with an *n*-alkyl group in this position when the chain length was approximately 17 carbon atoms. Tomato blight (*Phytophthora infestans*) was controlled under greenhouse conditions by a spray containing 1·5 oz. of 2-heptadecyl-4, 4, 6-trimethyltetrahydropyrimidine per 100 gals. per acre; phytotoxicity was noted at 6 oz. per 100 gals. Celery blight (*Septoria apii-graveolentis*) was controlled at 6 oz. per 100 gals. without injury to the plants. No control was obtained of powdery mildew (*Erysiphe polygoni*) on bean [*Phaseolus vulgaris*] and only moderate control of bean rust (*Uromyces appendiculatus*).

Only preliminary field assessment of the efficacy of these compounds was made, but successive applications to field plots of tomatoes and potatoes demonstrated that with some formulations there may be a cumulative effect of the tetrahydropyrimidines, injury appearing after four to six treatments. Phytotoxic response appeared as leaf bronzing and necrosis or, in mild cases on potatoes, as foliage rugosity.

Nonveiller (G.). **Današnja situacija razvoja aviometode.** [The present-day position of the development of aero-methods.]—*Zašt. Bilja* [*Plant Prot., Beograd*], *1951*, 6–7, pp. 10–29, 4 pl., 1951. [French summary.]

In this general review of the progress made since the second world war in the use of aircraft in the control of plant pests and diseases in North America and Europe [*R.A.M.*, 31, p. 393 and below, p. 473] the types of aircraft and spraying and dusting apparatus in use are described. Such methods have given good control of forest pathogens, though they have not been found very satisfactory for agriculture in most European countries. Helicopters, though not yet generally employed, are increasing in popularity. Conditions necessary for successful aerial control are described, with particular reference to the various economic and technical aspects.

In Yugoslavia the use of aeroplanes for plant protection is gaining ground, though further studies are required before the value of the practice can be assessed.

Köhler (H.). **Dibutyl-naphthalin-sulfosäures Natrium, ein neues Fungizid.** [Dibutyl-naphthalene sodium sulphonate, a new fungicide.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 5, 8, pp. 145–148, 1951.

In field experiments at the Aschersleben [Saxony] branch of the German Biological Institute, raspberry spur and cane blights (*Didymella applanata* and *Leptosphaeria coniothyrium*) [C.M.I. maps Nos. 72 and 185] were most effectively combated by copper sprays containing a wetter composed of 60 per cent. dibutyl-naphthalene sodium sulphonate and 40 per cent. sodium sulphate, subsequently designated 'debena'. The compound proved equally useful as an adjunct in the field treatment of cabbage against *Alternaria circinans* [*A. brassicicola*], and in laboratory tests, either alone at 0·1 and 0·5 per cent., or at 1 per cent. in combination with 1 per cent. cupral, cuproxal, polybar, nirit [*R.A.M.*, 30, p. 374], copper spray arcal, or copper-lime, it inhibited the growth of the same species in culture on oatmeal agar. Among other pathogens prevented from growing by debena at 0·5 per cent. in solid or liquid media were *Rhizoctonia* [*Corticium*] *solani*, *Fusarium culmorum*, *A. tenuis*, and *Ascochyta pinodella*. To achieve a comparable result with *Phoma apiicola* it was necessary to use debena, nirit, or ceresan at 1 per cent. and fusariol at 0·5.

In phytotoxicity tests debena was beneficial or innocuous to the germination of wheat and barley seed except at concentrations exceeding 6 per cent. It appeared to depress the germination of pea seed at 1 but not at 2 or 5 per cent.

Anderson (B. I.) & Swaby (R. J.). **Factors influencing the fungistatic action of 8-hydroxyquinoline (oxine) and its metal complexes.**—*Aust. J. sci. Res.*, Ser. B, 4, 3, pp. 275–282, 1 pl., 1951.

In studies at the Bacteriology Department, New Medical School, University of Sydney, the fungistatic effect of 8-hydroxyquinoline (oxine) [see next abstract] against *Aspergillus niger* [*R.A.M.*, 30, p. 177] was greatly reduced in the absence of cupric copper and to a lesser degree of ferrous iron from the liquid medium; increased toxicity resulting from increasing the copper content was overcome, even when quite large amounts of copper were present, by lowering the pH of the medium. A slight reduction in toxicity occurred with large amounts of molybdenum, but none was obtained with high concentrations of cobalt, zinc, iron, copper, and manganese. The fungistatic action of four of the seven other chelators tested was increased by the presence of copper. The possible mode of action of oxine and its metal complexes on fungal cells is discussed.

Crowdy (S. H.) & Davies (Mary-Elizabeth). **Studies on systemic fungicides. II. Behavior of groups of reported chemotherapeutants.**—*Phytopathology*, 42, 3, pp. 127–131, 1 graph, 1952.

At the Rhode Island Agricultural Experiment Station several groups of compounds of reputed chemotherapeutic efficiency were tested for their capacity to reduce the intensity of chocolate spot disease of broad bean (*Botrytis fabae*) by the methods hitherto employed by Crowdy in England [*R.A.M.*, 31, p. 249]. Significant reductions in disease were obtained by the application to the roots of 8-hydroxyquinoline sulphate [ibid., 26, p. 430] (31 per cent. reduction), 8-hydroxyquinoline benzoate [loc. cit.] (35), 8-hydroxyquinoline succinate, 8-hydroxyquinoline,5-sulphuric acid (both 28), and 2-hydroxy, 4-methylquinoline (31), all at 1 p.p.m. The results of parallel spore germination tests with *Alternaria solani* [see above, p. 443] revealed no necessary correlation between the ability of the compounds to enhance resistance to *B. fabae* in broad beans and their aptitude to inhibit spore germination in the former fungus, the LD 50 values of the five mentioned above (in the order given) being 1, 1, 1, 220, and 380 p.p.m., respectively. All the quinolines were phytotoxic at a dosage of 10 p.p.m. but could be safely used at 1 p.p.m.

Of six dyestuffs tested, helione A (presumed to be 2,4-diamino-5-methyl azobenzene hydrochloride) [cf. ibid., 21, p. 394] at 10, 50, or 100 p.p.m. was the only one that consistently reduced the size of the lesions. Its LD 50 value was 30 p.p.m. and it was one of the least phytotoxic of the chemicals used.

Salicylic acid reduced the incidence of infection by 28 and 39 per cent. at 10 and 1 p.p.m., respectively [cf. ibid., 26, pp. 268, 294; 31, p. 412], the LD 50 value being near 500 p.p.m.

Two trials were carried out with a series of complex metallic dinicotine salicylates, in one of which the reductions in disease percentages effected by cadmium, cobalt, manganese, and nickel radicals at 10 p.p.m. [of the compound] were 61, 60, 76, and 41, respectively. In the other test the reductions were smaller but still significant for cadmium and manganese and also with copper at 1 p.p.m. The LD 50 values for cadmium, cobalt, and nickel at 10 p.p.m. of the radical were 8, 75, and 110 p.p.m. of the compound, respectively, while manganese caused no inhibition at 500 p.p.m. All these compounds, especially nickel, were injurious to the plants.

Para-aminobenzoic acid [cf. ibid., 27, p. 147] reduced the incidence of chocolate spot by 37 and 73 per cent. at 1 and 10 p.p.m., respectively, its LD 50 value being 34 p.p.m.

The reductions in disease percentage effected by urea at 10 p.p.m., N N'bis (2,4-dichlorophenyl) urea, 4-chlorophenylthiourea, N N' (4-chlorophenyl) thiourea, and N N'bis (β-naphthyl) thiourea (all at 1 p.p.m.) were 22, 31, 43, 23, and 51,

respectively, and the corresponding LD 50 values, above 10, above 1,000, 35, 480, and above 1,000. At 10 p.p.m. all these formulations except urea were severely phytotoxic.

GATTANI (M. L.). **Lysis in rust uredospore germ tubes.**—*Phytopathology*, 42, 2, pp. 70–71, 1 fig., 1952.

In further studies, initiated at the Agricultural Research Institute, New Delhi, and continued at the Department of Agriculture, Government of Rajasthan, Bharatpur, India, on the lytic action of a hydrophobic colloidal lime-sulphur fungicide on the uredospore germ tubes of some rust species, a preliminary note on which has already appeared [*R.A.M.*, 29, p. 553], *Puccinia glumarum* and *Melampsora lini* proved to be more sensitive than *P. graminis tritici*, *P. triticina*, *P. carthami* [ibid., 29, p. 534], and *Uromyces decoratus* [ibid., 18, p. 141]. The germination of *P. carthami* and *U. decoratus* was normal except for short germ tubes in the former. At 20 p.p.m. the fungicide inhibited uredospore germination in all the rusts tested.

FISCHER (C. W.) & KELLER (J. R.). **The prevention of decay in horticultural products by the use of brominated activated charcoal.**—*Proc. Amer. Soc. hort. Sci.*, 57, pp. 432–438, 7 figs., 1951.

The information in this paper has already been noticed from another source [*R.A.M.*, 30, p. 321].

SEMPIO (C.). **La lotta chimica contro le malattie crittogamiche delle piante.** [The chemical control of cryptogamic diseases of plants.]—*Quad. Sez. Perug. Soc. ital. Biol. sper.* 8, 32 pp., 1950. Lire 200. [Received February, 1952.]

The author succinctly reviews and discusses the available information on the chief groups of fungicides and adjuvants, briefly describing their fundamental characteristics and their mode of action. Sections deal, respectively, with copper and its derivatives, sulphur and its derivatives, other inorganic fungicides, organic fungicides, adjuvants and activators, general considerations, and endotherapy. In the concluding section suggestions are made as to the lines along which further research should proceed.

PALTI (J.) & MINZ (G.). **Estimation of the incidence and destructiveness of plant diseases. II. Evaluation of estimates and uses of estimations.**—*Bull. Res. Coun. Israel*, 1, 3, pp. 54–66, 1951.

A further paper in this series from the Division of Plant Pathology, Agricultural Research Station, Rehovot, Israel [cf. *R.A.M.*, 30, p. 527], is concerned with the evaluation of estimates of the prevalence of plant diseases and of the degrees of infection. Incidence is computed by attributing to each category of appraisal [loc. cit.] a numerical value or mark according to the area of tissue affected. If the unit of evaluation is identical with the unit of appraisal, the total of marks for all units appraised on a given plot is divided by the number of those units, thus giving the disease rating of the plot. If leaves have been appraised separately but evaluation is to be based on the degree of infection of each branch or plant, the marks attributed to each component must first be totalled or averaged before proceeding as above. In some cases of defoliating diseases [ibid., 29, p. 626] the incidence of disease on leaves that have been shed may be taken into account.

The destructiveness of disease is represented by its effect on the size and quality of the yield. The effect on the size of the yield depends not only on incidence but on the stage of host growth at which the disease appears, the vigour of the host, and the rate and intensity of disease development. Since none of these factors is capable of accurate quantitative expression, it is concluded that incidence cannot

readily be interpreted to indicate the destructive effect of disease on yield size and, therefore, cannot replace yield data, though it may help to give a fuller interpretation. The limitations of some of the methods proposed for such interpretation are indicated.

In assessing diseases directly affecting the quality of agricultural produce incidence is a fair indication of the destructiveness of such diseases.

A bibliography of 77 titles is appended.

International conference on some crop protection problems in world agriculture 26th, 27th and 28th June, 1951.—116 pp., 5 pl., 7 figs., 1 map, London, Plant Protection Ltd., 61 Curzon St., W.1, 1952.

This Conference, held at Fernhurst Research Station, Haslemere, Surrey, sponsored by Plant Protection Ltd., and attended by delegates from 43 countries, included the following papers for discussion: 'Wastage of world food supplies through pests and diseases', by Sir J. Russell; 'Fungicides, their development and uses', by J. F. H. Cronshey; 'Control of virus diseases', by K. M. Smith; and 'Factors limiting crop protection progress', by E. Holmes. It concluded with a demonstration of crop protection machinery.

Feder (W. A.). **An improved moist chamber.**—*Science*, 115, 2997, pp. 632–633, 1952.

A disadvantage attaching to the use of the ordinary form of damp chamber, i.e. the ability of fungi and bacteria to contaminate the dampened surface of filter paper, has been overcome by using cellulose sponge yarn (Film Division of E.I. du Pont de Nemours & Co., Inc., Wilmington, Delaware), which has a high water-holding capacity, as the humidifying agent. A piece can be arranged round the inner wall of the moist chamber clear of free water. The yarn may be used again after sterilization [cf. *R.A.M.*, 31, p. 73].

Piemeisel (R. L.), Lawson (F. R.), & Carsner (E.). **Weeds, insects, plant diseases, and dust storms.**—*Sci. Mon., N.Y.*, 73, 2, pp. 124–128, 2 diags., 1951.

Weeds and their insect colonizers, plant diseases spread by the latter, and dust storms are diverse consequences proceeding from a common source, deterioration of the native plant cover. The authors here present a broad view of a particular series of difficulties drawn from experience in the western States, chiefly Idaho and California, illustrating it by a concrete example, namely, the breeding of the leafhopper vector of beet curly top virus [*Eutettix tenella*] on its various weed hosts, and its subsequent migration to sugar beet and many other cultivated plants [*R.A.M.*, 30, p. 237].

Butler (F. C.). **Anthracnose and seedling blight of Bathurst Burr caused by Colletotrichum xanthii Halst.**—*Aust. J. agric. Res.*, 2, 4, pp. 401–410, 1 pl., 1951.

During the past three seasons, widespread destruction of Bathurst burr (*Xanthium spinosum*), locally one of the most serious weeds of pasture land, has been caused in the summer rainfall areas of New South Wales by *Colletotrichum xanthii*, described by Halsted in 1893 (*Bull. Torrey bot. Cl.*, 20, pp. 250–252). The disease, not before recorded in the State, was first noted in the Central Tableland, but has now become established throughout the North-western and Central Western Slopes and Plains. Pathogenicity tests by spore suspension spraying carried out on Bathurst burr and 20 other species of crop plants and weeds indicated that the fungus is confined to the genus *Xanthium*, though *X. pungens* is resistant.

The disease is characterized by stem lesions of the anthracnose type, which tend

to produce a 'ring-bark' effect, and it may also cause seedling blight. It overseasons on old burr remains. Under suitable conditions plants die within one to three weeks of the onset of blighting, the majority of young plants being killed before fruiting. Late infection of well established plants may have no appreciable effect on fruiting and seed viability.

Since 1947–8 infection has developed naturally in 50 different parts of New South Wales, and in 1949–50 it was artificially established in 16 new localities. In three seasons it largely obviated the necessity for other methods of destruction.

Ribaldi (M.). **Osservazioni preliminari sui caratteri morfologici e sulle proprietà antibiotiche di Myrothecium verrucaria (Alb. et Schw.) Ditmar.** [Preliminary observations on the morphological characters and antibiotic properties of *Myrothecium verrucaria* (Alb. & Schw.) Ditmar.]—Reprinted from *Ann. Fac. Agr. Perugia*, 7, 10 pp., 3 pl., 1951.

An account is given of morphological studies on *Myrothecium verrucaria* [cf. *R.A.M.*, 23, p. 191; 30, p. 529], isolated from soil planted with maize in an experimental field at Turin. Preliminary experiments showed the author's strain to be feebly antagonistic to *Rhizoctonia* [*Corticium*] *solani* (from potato), *Botrytis cinerea*, and *Fusarium* sp. [cf. ibid., 27, pp. 83, 145]. Further work is in progress.

Thorn (J. A.) & Haskins (R. H.). **Biochemistry of the Ustilaginales. V. Factors affecting the formation of ustilagic acid by Ustilago zeae.**—*Canad. J. Bot.*, 29, 4, pp. 403–410, 4 graphs, 1951.

In studies at the Prairie Regional Laboratory, Saskatoon, yields of ustilagic acid by *Ustilago zeae* [*U. maydis*] (PRL 119) [*R.A.M.*, 29, p. 556 and next abstract] in submerged culture increased with increasing rates of aeration and with increasing cerelose (glucose) concentration. Urea gave slightly higher yields (12 mg. per ml.) than ammonium salts; corn steep liquor was optimum at a concentration of 0·06 per cent. (17 mg. per ml.).

Haskins (R. H.) & Thorn (J. A.). **Biochemistry of the Ustilaginales. VII. Antibiotic activity of ustilagic acid.**—*Canad. J. Bot.*, 29, 6, pp. 585–592, 1 pl., 1951.

The antibiotic activity of *Ustilago zeae* [*U. maydis*] (PRL 119) cultures was found to be due chiefly to ustilagic acid [see preceding abstract], which is identical with ustizeain B [*R.A.M.*, 29, p. 556]. All samples of ustilagic acid obtained displayed antibiotic activity, which was not materially altered by recrystallization and heating the culture mixture for periods of up to one hour at temperatures under 100° C. Incorporated in potato dextrose agar, ustilagic acid completely inhibited growth of *Thielaviopsis basicola*, *Claviceps purpurea*, *Rhizoctonia* [*Corticium*] *solani*, *Aspergillus niger* and *Helminthosporium sativum* at concentrations between 3·1 and 6·3, 6·3 and 12·5, 12·5 and 25, 12·5 and 50, and 25 and 50γ per ml. agar, respectively, and *Xanthomonas campestris* and *X. translucens* [var.] *cerealis* between 5 and 10γ per ml. It failed to inhibit growth of *Alternaria tenuis*, *Armillaria mellea*, *Gliocladium roseum*, and *Polyporus circinatus* at 50γ per ml.

Gottlieb (D.) & Siminoff (P.). **The production and role of antibiotics in the soil. II. Chloromycetin.**—*Phytopathology*, 42, 2, pp. 91–97, 2 graphs, 1952.

In further studies at the University of Illinois on the development and function of antibiotics in the soil [*R.A.M.*, 30, p. 482; 31, p. 344] the authors found that chloromycetin (or chloramphenicol) [loc. cit.] can be produced by *Streptomyces venezuelae* grown in unamended soil. A substantial increase in the production of the antibiotic was effected by the addition of tryptone to the soil. Added to a non-sterile soil, the antibiotic was rapidly degraded by members of the soil population.

Gregory (K. F.), Allen (O. N.), Riker (A. J.), & Peterson (W. H.). **Antibiotics as agents for the control of certain damping-off fungi.**—*Amer. J. Bot.*, 39, 6, pp. 405–415, 10 graphs, 1952.

In co-operative studies at the University of Wisconsin 26 samples of soil, peat, and chaff yielded 31 bacteria, 29 actinomycetes, and 14 fungi strongly antagonistic in agar culture to *Pythium debaryanum*. Of the most potent cultures, three actinomycetes and one bacterium were unharmful to the root nodule bacteria *Rhizobium meliloti* and *R. trifolii*. Actidione [*R.A.M.*, 31, pp. 129, 344] and fradicin [ibid., 30, p. 58] were active against *P. debaryanum* and *P. ultimum* and inactive against *R.* spp., while clavacin from *Penicillium patulum* [ibid., 31, p. 344] and gliotoxin from *Trichoderma lignorum* [*T. viride*: ibid., 31, p. 238] were toxic to both types of organism. A new streptomycete isolate, A 67, yielded an antibiotic active against *Pythium debaryanum*, *P. irregulare*, and *Metarrhizium glutinosum* [*Myrothecia verrucaria*].

Antibiotic production and stability in soil were studied by means of a displaced soil solution technique in conjunction with a selective medium, using *P. debaryanum* as the assay organism. *Penicillium patulum*, *T. viride*, A 67, and *Bacillus* sp. B 6 displayed potent antibiotic activity in sterile soil containing suitable organic material. B 6 showed more activity in suitably treated soil than in liquid culture. *P. patulum* and B 6 produced appreciable quantities of antibiotic in non-sterile soil containing a mixture of 0·5 per cent. soy-bean meal, 0·5 per cent. glucose, and 0·2 per cent. corn steep liquor; the concentrations were less than those in sterile soil. Antibiotic activity of the soil solutions attained a peak after four days' incubation at 30° C. and largely or completely disappeared in eight days. Stabilities in soil of the antibiotics produced by the four organisms and of actidione and fradicin were not markedly affected by soil type or reaction (pH 5·3 to 7·8). Gliotoxin was not detected within a few hours; the antibiotics from A 67 and B 6 persisted for about one day; clavacin remained one day in alkaline and two to four days in acid soils. In the alkaline soils (pH 7·8) actidione was present at eight days, while in acid (pH 5·3 to 5·6) 10 μgm. per gm. of soil remained for 14 days. Fradicin was strongly adsorbed by acid soils, but after 14 days about 90 per cent. remained in both the acid and alkaline soils. Three concentrations each of actidione, fradicin, clavacin, and the antibiotic from A 67 employed in diverse combinations produced no synergistic effects against *Pythium debaryanum* or *P. ultimum*; an additive effect, such as resulted from a combination of A 67 and clavacin, was the usual reaction. Actidione and fradicin interfered with each other.

Smith (W. H.). **Deterioration in fruits and vegetables during marketing.**—*Fruit Gr., 1952*, 2949, pp. 22–23, 1952.

A survey of the deterioration of some fruit and vegetable crops during marketing in England showed that the quality of Cornish broccoli has been markedly affected by deterioration in the strains during the war. Most of the deterioration in broccoli occurs at the retail stage of marketing. Tests demonstrated that home-grown and imported cauliflowers could be stored for three weeks at 32° F. and remain in marketable condition. No serious deterioration was noted in initially sound lettuce up to the wholesale market stage, most of the deterioration normally taking place after the relatively short time taken to reach the retailer. In lettuce free from aphis infestation the main forms of spoilage were wilting and rotting. The use of crushed ice and moisture-proof crate liners kept the lettuce in excellent condition.

Serious deterioration of sound plums picked at the right stage of maturity is unlikely until after the fruit has been through the wholesale market, when losses from rotting can be very heavy; the evidence indicated that more rapid deterioration occurs in plums picked without their stalks. Tests of the effects of pre-cooling in reducing wastage in plums are in progress.

The value of cooling before transportation and of extending the use of solid carbon dioxide in reducing deterioration in strawberries is also being examined.

Niethammer (A[nneliese]) & Wollny (B. A.). **Untersuchungen an aeroben cellulosezersetzenden Mikroorganismen.** [Studies on aerobic cellulose-destroying micro-organisms.]—*Holz a. Roh- u. Werkst.*, 9, 6, pp. 213–216, 5 figs., 1951.

At the Botanical Institute of the Technical College, Stuttgart, the authors studied by means of X-ray diffraction the action on filter paper in a mineral salts solution at 22° [C.] of various moulds and bacteria isolated from horse dung and soil samples [cf. *R.A.M.*, 22, p. 121; 31, p. 394]. The micro-organisms fell into three groups in respect of their capacity for cellulose disorganization, the most active being *Trichoderma koningi* [*T. viride*], an undetermined species of *Verticillium*, and five bacteria.

Sempio (C.) & Castori (Maria). **Sulla germinibilità dei conidi di Oidium monilioides Link.** [On the germinability of the conidia of *Oidium monilioides* Link.] —*Riv. Biol.*, N.S., 42, 3, pp. 287–293, 1 graph, 1950. [English summary. Received February, 1952.]

Studies at the University of Perugia, Italy, on the germinability of the conidia of *Oidium monilioides* [*Erysiphe graminis*: cf. *R.A.M.*, 29, pp. 15, 630; 30, p. 384] showed that their vitality is greatest from the second to the fourth day after formation, during which period the germination percentages and promycelial lengthening are highest. Later, germinability decreases more or less rapidly, according to the season. From November to December it persists for more than a month after formation in about 5 per cent. of the conidia. In May to June germinability is reduced to 4 or 5 per cent. ten days after formation, and by the 15th day it is virtually lost. Light rays between 5,500 and 7,500 Å and particularly those above 6,000 Å depress germinability, whereas those between 5,500 and 4,000 Å stimulate it.

Sebek (O. K.). **Physiological properties of Fusarium lycopersici and Fusarium vasinfectum.**—*Phytopathology*, 42, 3, pp. 119–122, 1952.

A comparative study at Fordham University, New York, of strain R–S–6 of *Fusarium* [*bulbigenum* var.] *lycopersici* and strain F–273 of *F. vasinfectum* demonstrated the production by both of the pigment lycopersin, originally isolated from the former species (*Arch. Biochem., N.Y.*, 21, pp. 457–458, 1949); the substance is formed and remains deposited in the mycelium. Both species grew on a number of organic media over a wide range of carbohydrate concentrations, temperature (13° to 32° C., with an optimum at 27° for *F. vasinfectum*), and pH (2·7 to 7·2 for *F. b.* var. *lycopersici* and 1·4 to 7·5 for *F. vasinfectum*), pigment development being most abundant within the pH range 2·7 to 4·5. The maximum quantities of mycelium were obtained in the presence of 10 per cent. glucose or 2·5 to 5 per cent. xylose. The addition to the medium of trace amounts of copper sulphate stimulated pigment production by *F. b.* var. *lycopersici*. Among the carbon compounds tested, meso-inositol promoted the heaviest development of lycopersin. The mechanism of its utilization is discussed.

Rich (A. E.). **Studies on phloem necrosis of Irish Potato tubers in Washington.**—*Bull. Wash. St. agric. Exp. Sta.* 528, 49 pp., 1 fig., 2 graphs, 1 map, 1951.

The author presents a fairly complete review of the literature (141 titles) on phloem necrosis of Irish potatoes due to potato leaf roll virus [*R.A.M.*, 29, p. 426] and on related problems. Surveys from 1947 to 1949 showed that the disorder occurs rather frequently at harvest time in Washington, developing in storage more rapidly at temperatures between 42° and 70° F. than at 32° or 80°. The number

of tubers affected appeared to increase during the first two or three months in storage, after which the damage within the tubers themselves increased. There was a marked reduction in stand and yield when necrotic tubers were used for planting compared with healthy ones, and a slight reduction compared with tubers infected with leaf roll but which did not show visible phloem necrosis. Plants infected early in the season produced the lowest yields and greatest amount of necrosis. Plants artificially infested with aphids carrying leaf roll [cf. ibid., 30, p. 118; 31, p. 201] and those grafted with leaf roll scions both yielded from 49 to 79 per cent. necrotic tubers. Madison was affected almost as severely as Ashworth in the 1949 variety trials. Varieties affected during 1948 and 1949 included Green Mountain, Russet Sebago, and LaSoda. Glenmeer, among others, remained free from phloem injury. Necrosis was controlled by using tubers free from leaf roll, early planting and harvesting, and to a certain extent by the use of combined DDT–sulphur or DDT–parathion dusts.

Norris (D. O.). **Spotted wilt of Potato. I. The field disease and studies of the causal virus. II. Tuber transmission and vector studies of the field disease.**—*Aust. J. agric. Res.*, 2, 3, pp. 221–242; 243–260, 6 pl., 5 graphs, 1951.

On Up-to-Date potatoes growing in New South Wales the first symptoms of current-season infection by [tomato] spotted wilt virus [*R.A.M.*, 22, p. 173; 30, p. 18] may frequently be detected from a distance, before the characteristic spotting is noted, by the pale green colour of affected shoots. Necrotic spotting of the top leaves is quickly followed by dark streaking in the cortex of the terminal portion of the stem. As a rule, the streaks are irregular and not sharply defined; sometimes they resemble elongated rings. After the death of the tip of a shoot, some basal leaves, mature at the onset of symptoms, may persist, but are thick, cupped, and dark green. In young, vigorously growing plants symptoms may appear almost simultaneously in all the shoots, but with increasing age at infection the time of invasion lengthens until, as the plant approaches maturity, symptoms appear only on the first affected shoot. In late-infected plants the only symptom expression may be in a small, concealed shoot. Plants surviving initial necrosis are dwarfed and bunchy as a result of the slow growth of axillary shoots with short internodes. The small, rolled, cupped, or waved leaves bear green and yellow ring spots, which become necrotic. Such plants gradually decline.

The shoots from infected tubers in the field grow in the form of a rosette, the leaves being thick and dark green, and covered with dark brown to black necrotic spots, specks, and rings, while most of the leaflets are rolled or waved. Shoots may die back completely or enter the secondary phase of infection, the new leaves bearing green and yellow ring spots.

In inoculation tests with the five pure strains of the virus complex [cf. ibid., 27, p. 222; 28, p. 52] the blight strain produced only local necrotic lesions. The necrosis strain caused local necrotic lesions, invaded only a few plants systemically, and did not enter the tubers. The ring spot strain readily caused systemic invasion of 68 per cent. of the plants, and was transmitted in some tubers. A mild and a very mild strain both caused local lesions only; the fact that they are present in the naturally occurring potato virus complex together with the ring spot strain is evidence of synergism. The complex present in potatoes in the field lacks the tip blight strain; the name 'potato type spotted wilt' is, therefore, suggested to distinguish it from the type generally occurring in tomatoes.

Greenhouse and field studies indicated that 30 to 40 per cent. of the tubers from affected plants transmit the disease [ibid., 22, p. 369; 28, p. 588], distorted tubers with terminal cracking due to early infection transmitting at a lower rate than those which appear normal. Some parts of infected tubers are free from the virus. Second generation diseased tubers give approximately the same transmission rate

as those of the first generation, but the incidence of terminal cracking is very low. A high proportion of the diseased plants emerging from infected tubers can survive the season and serve as a source of infection.

The available evidence suggests that the roguing of current-season infected plants to protect the next year's crop is uneconomic. Tubers of susceptible varieties, such as Up-to-Date, should not be saved from crops showing more than the fixed tolerance of 5 per cent.; they should be very carefully graded and any showing symptoms discarded. Emerging plants should be inspected early and often and rogued before *Thrips tabaci* can breed on them. In the year following an epidemic every effort should be made to replace a susceptible variety by a resistant one, planting only the minimum quantity of tubers of the susceptible variety required for the seed supply crop. The prevalence of the disease in eastern Australia [cf. ibid., 30, p. 358] is due to the planting of highly susceptible varieties at such a time that their period of succulent, pre-flowering growth coincides with the time of maximum thrips activity.

Hutton (E. M.) & Peak (J. W.). **Some strains of Potato virus X and their spontaneous mutation.**—*Aust. J. sci. Res.*, Ser. B, 4, 3, pp. 223–230, 2 pl., 1 graph, 1951.

Studies were made at the Division of Plant Industry, Canberra, on host reactions to three avirulent strains of potato virus X [*R.A.M.*, 29, p. 274], designated 31–45, 50–57, and 50–58, and a virulent strain 25-144. In globe amaranth (*Gomphrena globosa*) plants, grown rapidly and inoculated just prior to or at the commencement of flowering, strain 25–144 produced from almost twice to three times the number of lesions of the avirulent strains, the results being highly significant. Both 31–45 and 50–58 produced significantly fewer lesions per leaf than 50–57.

The results of tests with two sweet pepper (*Capsicum frutescens*) varieties showed a correlation with the previous ones, and a difference in the type of reaction to the virus between the varieties, the necrotic reaction appearing to be genetically controlled. On an unnamed variety none of the strains caused necrosis, and growth, although mottled, approached normal. Small necrotic spots in ill-defined rings appeared rapidly on the inoculated leaves of World Beater no. 13, their number and extent giving a virulence rating comparable with that obtained with *G. globosa* [ibid., 31, p. 138]. Abscission of the inoculated leaves was rapid and the necrotic systemic symptoms were accompanied by marked growth depression.

Each virus strain was cultured continuously in *Datura stramonium* plants, being transferred every two or three weeks during the two years of the experiments. During the first year the avirulent strains proved unstable and mutated to a severe form from time to time, in one or two and sometimes three of the six replicates used for each transfer. When instability in these strains was suspected close observation of the *D. stramonium* plants after a serial transfer often revealed one or two small yellow flecks situated close together in otherwise symptomless leaves. When the flecks were excised and inoculated to *D. stramonium* a severe yellow mottle resulted. It appears, therefore, that the virulent mutant arises spontaneously in one sector of a leaf, possibly from a single virus particle or aggregate. Three serial transfers from a leaf carrying a single small yellow fleck were usually required to establish the virulent mutant in high concentration and suppress the avirulent parent strain.

During the second year strain 50–58 was the least stable, all the lines being discarded in eight months because of mutation. Strain 50–57, which, of the avirulent types, had previously developed the highest virus concentration in *D. stramonium*, had the lowest mutation rate, two lines remaining stable after twelve months. Strain 31–45 had a mutation rate intermediate between 50–58 and 50–57. It is suggested that low virus concentrations tend to favour a high mutation rate.

The increased photoperiod and rising temperatures of spring and early summer raised the mutation rates of the more stable 31–45 and 50–57. The mutants observed were indistinguishable from ordinary virulent strains, the course of mutation following the same pattern irrespective of the parent avirulent strain.

Stapp (C.) & Bartels (R.). **Der serologische Nachweis des X-Virus in Augenstecklingen.** [The serological demonstration of the X-virus in eye cuttings.]—*NachrBl. dtsch. PflSchDienst, Stuttgart*, 3, 8, pp. 117–118, 1951.

In serological tests by the leaflet method [*R.A.M.*, 30, p. 428 and next abstract] at the Brunswick branch of the German Biological Institute in the winter of 1950–1, eye cuttings of the Erstling [Duke of York], Krebsfeste Kaiserkrone, Direktor Johanssen, Marktredwitzer Frühe, Urtica, Heimkehr, and Prisca potato varieties reacted positively for the presence of virus X three weeks after setting out in the greenhouse, notwithstanding the unfavourable conditions (low light intensity inducing etiolation and an unduly high temperature, up to 25·7° C.) purposely selected for the demonstration.

Stapp (C.) & Bartels (R.). **Ein weiterer Beitrag zum serologischen Nachweis des X-Virus in Kartoffeldunkelkeimen (vorläufige Mitteilung).** [A further contribution to the serological detection of the X-virus in Potato sprouts kept in the dark (preliminary note).]—*NachrBl. dtsch. PflSchDienst, Stuttgart*, 3, 10, pp. 145–147, 1951.

The serological determination of potato virus X by the leaflet method [see preceding abstract] in potato shoots sprouted in the dark, hitherto applicable only at the close of the dormant period from February onwards, could be used as early as October on 23 out of 30 varieties treated by fumigation with 'rindite' (anhydrous ethylene chlorohydrin, ethylene dichloride, and carbon tetrachloride, 7:3:1) at a dosage of 0·5 ml. per l., as prescribed by Denny in *Contr. Boyce Thompson Inst.*, 14, pp. 1–14, 1945. Sprouting was impeded in seven varieties by fumigation in September, but 29 were successfully treated in December, and detection of the virus was not prevented by overdosage with the chemical.

Klinkowski (M.). **Die Wirkung des X-Virus auf den Ertrag der Kartoffelsorten Ackersegen und Voran.** [The effect of the X-virus on the yield of the Potato varieties Ackersegen and Voran.]—*Z. PflKrankh.*, 58, 7–8, pp. 241–245, 1951.

From a survey of the pertinent literature it may be concluded that potato virus X [see preceding abstracts] is responsible for more or less heavy reductions in yield, roughly proportionate to the virulence of the particular strain implicated [*R.A.M.*, 23, p. 74; 24, p. 162; 26, p. 413; 31, p. 202]. The results of experiments at the Aschersleben [Saxony] branch of the Biological Institute in 1949 confirmed the foregoing observations in respect of the Ackersegen variety, in which the number of tubers was reduced by more than half and their weight by 74 per cent. in consequence of infection. In one series of tests in 1950, the yield reduction of Voran amounted to 43 and in another to 11 per cent. Losses of this order call for a revision of the current opinion that virus X is of no account. In this connexion the author envisages the organization of a German scheme similar to the Australian for production of 'FX' (free from virus X) potatoes [ibid., 27, p. 222].

Krstev (K.). Принос към борбата срещу къдравостта по Картофа у нас. [Contribution to the control of Potato rugose mosaic in our country.]—*Ann. Fac. Agron. Dimitrov Acad.*, 28 (*1949–1950*), pp. 137–146, 1950. [Russian summary.]

Virus diseases are very common on potatoes in Bulgaria and are relatively of great economic importance. Studies to determine their spread and the damage

caused as well as to find a variety resistant to potato virus Y [*R.A.M.*, 30, pp. 65, 67, 262], which is extremely widespread, were conducted at the Faculty of Agronomy, Sofia. In field trials the yield reduction of infected plants ranged from 57 to 72 per cent. due to virus Y and 26 to 53 per cent. by virus X [ibid., 30, p. 67]. Decrease in yield due to leaf roll was up to 59 per cent. Of the 33 foreign and 114 local varieties tested in the field from 1941 to 1950 only Arran Peak showed an unusually high resistance to virus Y, bearing only traces (1 to 2 per cent.) of infection. It is recommended for cultivation in Bulgaria because of its immunity from leaf roll [ibid., 31, p. 76], its resistance to fungus diseases, its high agricultural quality, and satisfactory yield.

Müller (K. O.) & Munro (J.). **The reaction of virus-infected Potato plants to Phytophthora infestans.**—*Ann. appl. Biol.*, 38, 4, pp. 765–773, 1 diag., 1951.

Experiments carried out at the National Institute of Agricultural Botany, Cambridge, showed that growth and sporulation of *Phytophthora infestans* was retarded in detached leaves and leaf pieces of potato plants previously inoculated with virus X or virus Y. The retarding effect caused by different strains of viruses X and Y on different potato varieties was greater the more severe were the systemic virus symptoms on the leaves before inoculation with *P. infestans*. In no instance did virus infection increase fungal development. It is suggested that reduced blight development on virus-infected leaves is due in part to increased resistance to infection and may result from the effect of the virus on the host protoplasm. It is recommended that tests for blight resistance should be made on virus-free material.

Hofferbert (W.) & Orth (H.). **Unsere Arbeiten zur Rhizoctonia-Frage bei der Kartoffel. I. Gibt es für den Züchter Möglichkeiten der Rhizoctonia methodisch zu begegnen?** [Our studies on the *Rhizoctonia* problem in the Potato. I. Are there possibilities for the systematic control of *Rhizoctonia* by the breeder?] —*Z. PflKrankh.*, 58, 7–8, pp. 245–256, 11 figs., 1951.

It was evident from the results of experiments at Ebstorf, Germany, that demonstrable differences in susceptibility to *Rhizoctonia* [*Corticium*] *solani* exist among commercial potato varieties and seedlings [*R.A.M.*, 30, p. 120], dependent on their rooting capacity and recuperative power after infection. Rooting capacity may be assessed on sprouts 1 to 3 cm. in height from freshly lifted tubers placed in the dark after fumigation to accelerate growth. The number of root primordia was found to range from 8 to 33 per sprout in different varieties and selections. In one lot of breeding material comprising 63 varieties and strains, 70 per cent. were severely, 19 per cent. moderately, and 11 per cent. mildly infected. In another test on 60 varieties the incidence of infection was correlated with time of maturity as follows: early, 57 per cent. mild, 46 per cent. moderate, and 7 per cent. severe; medium-early, 18 per cent. moderate and 19 per cent. severe; medium-late, 29 per cent. mild, 18 per cent. moderate, and 29 per cent. severe; and late, 14, 18, and 45 per cent., respectively.

The virulence of a weakly pathogenic isolate of the fungus was enhanced by the addition to the potato juice agar medium of cellulose in the form of sterile, dried or fresh fragments of plant tissue or sterile filter paper.

Johnson (G.) & Schaal (L. A.). **Relation of chlorogenic acid to scab resistance in Potatoes.**—*Science*, 115, 2997, pp. 627–629, 1 fig., 3 graphs, 1952.

In studies carried out at the Colorado Agricultural Experiment Station and the Bureau of Plant Industry, U.S.D.A., Fort Collins, Colorado, the presence of chlorogenic acid was demonstrated in potato tubers by exposing a patch of tissue under the epidermis, adding a drop of 5 per cent. ferric chloride solution, and macerating

the exposed tissue with a knife. A green colour developed immediately and the intensity varied with resistance to scab (*Streptomyces* [*Actinomyces*] *scabies*), all highly resistant varieties giving a strong colour reaction. Ultra-violet absorption spectral curves and paper chromatograms of peel extracts also revealed a much higher concentration of the acid in a resistant than in a susceptible seedling. In some resistant varieties the chlorogenic acid appears to be more heavily concentrated in the periderm and particularly near the lenticels, which serve as the natural avenue of entrance for *A. scabies*, and round injuries, mechanical or parasitic.

Nielson (L. W.). **Internal cork of Sweetpotatoes ; production of corky lesions in core-grafted roots.**—*Plant Dis. Reptr*, 36, 4, pp. 132–134, 1952. [Multilithed.]

The rapid development of cork lesions in roots of Porto Rico sweet potatoes core-grafted with diseased tissue may be a useful method of studying internal cork virus disease [*R.A.M.*, 30, p. 580]. It reduces the time required for obtaining disease readings and for the tedious process of growing a root crop to demonstrate the effect of various treatments. The method may prove to be an essential step in appraising resistance to the disease in various breeding stocks and selections.

In a preliminary experiment started in March, 1951, at North Carolina State College, Raleigh, healthy roots from the 1950 California crop, about $1\frac{1}{2}$ in. in diameter, were cut in half lengthwise, one half of each root being core-grafted with corky tissue by Nusbaum's method (*Bull. S.C. agric. Exp. Sta.* 381, 1950) and held in a moist chamber at room temperature; the other half was held as control. Lesions were present in the inoculated half roots in September, 1951. In July, whole roots of disease-free California Porto Rico stock were inoculated with corky tissue and bedded in sand in the greenhouse. The lesions in roots cut on 31st August were $\frac{1}{16}$ in. or less in diameter, while on 29th October and 14th December some were $\frac{1}{2}$ in. in diameter and the number per root varied from one to six.

This method of obtaining internal cork readings was applied to several sweet potato selections, the roots of which produced either atypical light brown or grey lesions with diffuse or indistinct margins, or a few typical lesions. So far three types of host reaction have been induced: (*a*) typical internal cork root lesions as in the Porto Rico variety, (*b*) relatively few indefinite lesions as in selection 262–27, and (*c*) resistant e.g. L–240 and HM 15, being accompanied in L–240 by chlorotic spots and vein clearing with some red pigmentation but in HM 15 with no apparent foliage symptoms. In neither variety was the virus recovered from the roots. This confirms Martin's observation that the foliage and root symptoms may be caused by different agents (*Phytopathology*, 40, p. 789, 1950).

Optimum survival of core grafts and inoculated roots was obtained when the latter were bedded immediately in warm, moist soil. Disinfection of bedding soil would probably be worth while. The inoculated roots should be put to sprout in an area protected from insects at temperatures favouring rapid cork lesion development (80° to 85° F.).

Hashioka (Y.), Yoshino (M.), & Yamamoto (T.). **Physiology of the Rice false smut, Ustilaginoidea virens (Cke) Tak.**—*Res. Bull. Saitama agric. Exp. Sta.* 2, 20 pp., 6 pl., 1951. [Japanese, with English summary.]

Studies made at Ageo, Saitama, Japan, on the rice false smut fungus (*Ustilaginoidea virens*) [*R.A.M.*, 26, p. 125 and next abstract], which causes considerable damage to both upland and lowland rice, demonstrated the following types of chlamydospore germination [ibid., 25, p. 139]: (*a*) in water the young spore produces a fine germ-tube bearing one to three conidia at and near the tip; (*b*) in a sugar solution one or two wide germ-tubes elongate to several times the diameter

of the spore without branching and produce up to several conidia; (*c*) in sugared potato decoction one to four wide germ-tubes branch vigorously, producing several conidia at the tip of each or elongating further without sporulation; and (*d*) very rarely short, wide germ-tubes may be produced, bearing a few appressoria-like conidia. The conidia germinate well in a nutrient solution but seldom in water. A few germ-tubes bear acrogenous secondary conidia similar in shape and mode of development to the primary.

In nature one to four sclerotia may occur on the spore balls, especially late in the season. After four months all the sclerotia kept under laboratory conditions were still viable, while in upland soil, alternate lowland and upland, and in irrigated lowland soil, respectively, the survival rate decreased to 80, 50, and 30 per cent. Up to several stalked perithecial stromata developed from sclerotia incubated at 24° to 30° C. for four to five weeks in moist sand. Numerous hyaline, cylindrical asci with a hemispherical apical appendage are produced in each perithecium. The hyaline, unicellular ascospores measure 50 to 80 by 0·5 to 1·5 μ. In water the ascospores develop one or two germ-tubes on which secondary spores are formed.

Chlamydospores were produced after 20 to 40 days on Saito's soy agar, unhulled and hulled rice decoction agar, and steamed rice. Mycelial development on potato decoction agar was improved by adding 1 to 3 per cent. glucose or 2 to 5 per cent. sucrose, concentrations which were found to be optimum. Optimum growth occurred at pH 6·02 to 6·74 at a temperature of 28°. Chlamydospores germinated easily only at an air humidity above 98 per cent.

During 1950 the disease occurred only on plants sown after the beginning of June. Outbreaks appear to depend on the amount of rain, especially from late July to August, the development of perithecial stromata requiring high air humidity and soil moisture. On examination 6,877 green smut balls were found to contain 99·6 per cent. intact anthers, indicating that most of the infection took place just before flowering [ibid., **26**, p. 125].

Lepori (L.). **Alcune osservazioni sulla morfologia e biologia dell' Ustilaginoidea virens (Cke) Tak. su materiale thailandese.** [Some observations on the morphology and biology of *Ustilaginoidea virens* (Cke) Tak. on material from Thailand.]—*Notiz. Malatt. Piante, 1951*, 16, pp. 40–46, 1951. [Mimeographed. English summary, p. 68.]

At the Plant Pathology Institute, Milan, a study was made of the symptoms, biology, cultural characteristics, and pathogenicity of the false smut organism (*Ustilaginoidea virens*) [*R.A.M.*, 31, p. 83 and preceding abstract] on rice plants received from Thailand. The history of the disease, taxonomy, geographical distribution, and epidemiology are discussed. Better growth occurred on malt agar and pepto-glucose broth than on potato agar. Attempts to infect Italian rice plants and grain were all unsuccessful. It is stated that the disease does not occur in Italy because by the flowering period in August the average temperatures are too low for sclerotial formation [but see ibid., **29**, p. 530].

Mariani (C.). **La concimazione potassica in relazione alla resistenza al 'brusone' parassitario del Riso.** [Potassium fertilizer in relation to resistance to parasitic 'blast' of Rice.]—*Notiz. Malatt. Piante, 1951*, 16, pp. 28–31, 1951. [Mimeographed. English summary, p. 68.]

In experiments carried out during 1951, near Trecate, Novara, Italy, rice plants of the variety Originario were raised in a nursery in which blast (*Piricularia oryzae*) [*R.A.M.*, 31, p. 140] was already present, and, on transplanting in July, one third were given potassium sulphate [cf. ibid., 31, p. 399] at the rate of 450 kg. per ha., the second receiving irrigation water from the first lot, while the third

had water direct from the source. Towards the end of September the fertilized plants were affected by blast to some extent although the maturity of the heads was unimpaired. In the two other plots, however, many spikelets were sterile and blackened and the rest of the plant was severely attacked. *P. oryzae* was isolated from the culms and leaves. Of a total of over 800 heads examined in each lot, 484, 4, and 0, respectively, had 0 to 10 per cent. sterile spikelets and 76, 582, and 834, respectively, had 75 to 100 per cent., while the weight in gms. of the spikelets present in 100 heads was 170·8, 70·2 and 34·5, respectively. The increased resistance to blast with potassium is attributed to better nutritional balance.

Togliani (F.). **Il mal del piede del Riso da Fusarium moniliforme Sh. nella pianura Emiliana.** [Foot rot of Rice caused by *Fusarium moniliforme* Sh. on the Emilian plain.]—*Notiz. Malatt. Piante, 1951*, 16, pp. 20–22, 1951. [Mimeographed. English summary, p. 67.]

In Italy rice foot rot caused by *Fusarium moniliforme* [*Gibberella fujikuroi*: *R.A.M.*, 25, p. 357] has recently appeared in Emilia. So far infection is localized and not of economic importance.

Saccas (A. [M.]). **Étude morphologique, biologique et expérimentale d'un Fusarium ravageur des cultures de Riz à la Station Centrale de Boukoko (A.E.F.).** [A morphological, biological, and experimental study of a *Fusarium* causing severe damage to Rice plantings at the Central Station, Boukoko (French Equatorial Africa).]—*Rev. Path. vég.*, 30, 2, pp. 65–96, 16 figs., 1951.

In 1948 and 1949 numerous rice varieties introduced from Madagascar and being grown under irrigated conditions at the Central Station, Boukoko, French Equatorial Africa, were severely attacked by a fungus which the author names *Gibberella fujikuroi* f. *oryzae* n.f. [without a Latin diagnosis]. The perithecia average 320 by 260 μ, the asci range from 75 to 85 by 14 to 16 μ, and the triseptate ascospores mostly 25 to 26 by 5 to 6 μ. The new form differs from the species in the septation of the generally unicellular microconidia (one septum rare, two exceptional), in the dimensions of the perithecia and ascospores, and the number of septa in the latter. The fungus is a virulent parasite and its spread into neighbouring areas as yet unaffected would seriously endanger rice yields.

The plants become affected when not more than four leaves have formed, wilting and death occurring some time before earing or when a few panicles have appeared. The plants suddenly wilt, with no sign of yellowing; on the contrary they are more advanced in growth than is normal and appear to be more vigorous; they seldom die before tillers have begun to form. When the plants are pulled up as they die the only place where mycelium, pinkish-white, loose, and flocculent, is found is covering the sheath and culm between the first and third nodes. The mycelium becomes thicker and bears numerous micro- and macroconidia. It is visible from a distance on the parts of dead plants a little above the water-line. Tissue underneath the mycelium is conspicuously brown and damaged. This discoloration at first appears on the first internode as a spot up to 1 cm. in diameter, almost the whole area rapidly becoming involved. It may spread upwards, but not above the third node. The necrosis affects the entire thickness of the tissues, the phloem and wood being filled with hyphae which impede translocation. This accounts for the sudden wilting. Abundant mycelium was also found in the hollow part of the culm. After plants have died in the field the lower half becomes covered with an abundant felty mycelium, the tissues decompose, and numerous dark blue, almost black, globular perithecia form, usually in groups, superficially on the sheath and culm.

The optimum temperature for conidial germination in saturated conditions was between 25° and 27° C. The sources of infection are the soil and seed from diseased

plants. The best control was given by steeping seed in formalin (0·25 to 0·5 per cent.) for 20 minutes. Treatment with formalin at 3 per cent. for three hours reduced germinability.

Ikata (S.). **The diseases of food crops. No. 1. Rice plant and Beans. (Series of Plant Pathology No. 6).**—2+12+320 pp., 26 pl., 94 figs., 1 graph, Tokyo, Asakura Shoten, [? 1951. Japanese.]

This well illustrated, comprehensive work appears to be a review of the main features of the diseases of rice, beans (various), pea, groundnut, cow-pea, sesame, and buckwheat and their causal agents, each with references to the important research work, mainly Japanese. The many rice diseases [cf. *R.A.M.*, 27, p. 446; 28, p. 355; 30, pp. 488, 620; 31, p. 31, *et passim*] dealt with include bacterial leaf blight (*Bacterium* [*Xanthomonas*] *oryzae*) [ibid., 31, p. 205], cinnamon speck of grains (*B. cinnamonum*), mouldy grain (*Absidia* sp., *Penicillium commune*, and *Aspergillus flavus-oryzae*), leaf spot (*Cercospora oryzae*) [C.M.I. map No. 71], downy mildew (*Phytophthora* [*Sclerospora*] *macrospora*) [*R.A.M.*, 20, p. 457], false smut (*Ustilaginoidea virens*) [see above, p. 456], glume blight (*Phoma glumarum*) [ibid., 17, p. 769], leaf smut (*Entyloma oryzae*) [ibid., 14, p. 498], *Rhizoctonia* sheath spot (*R. oryzae*) [cf. ibid., 17, p. 622; 26, p. 415], and dwarf virus [ibid., 28, p. 588 and C.M.I. map No. 43].

Diseases of adzuki beans (*Phaseolus radiatus* var. *aurea*) [*P. angularis*] described include anthracnose (*Colletotrichum phaseolorum*) [*R.A.M.*, 16, p. 12], brown leaf spot (*Phyllosticta phaseolina*) [cf. ibid., 27, p. 7], *Ascochyta* leaf spot (*A. phaseolorum*) [cf. ibid., 21, p. 45], powdery mildew (*Sphaerotheca fuliginea*), rust (*Uromyces appendiculatus*) [ibid., 10, p. 343], mosaic virus [ibid., 2, p. 52], and leaf spot due to *Cercospora canescens* [cf. ibid., 16, p. 492].

Diseases of broad beans dealt with include chocolate spot (*Botrytis fabae*) [ibid., 13, p. 741], stem wilt (*Fusarium avenaceum* var. *fabae*) [cf. ibid., 23, p. 422], and rust (*Uromyces fabae*) [ibid., 10, p. 343; 20, p. 426], while those of soy-beans include downy mildew (*Peronospora manshurica*) [ibid., 6, p. 74], brown spot (*Septoria glycines*) [loc. cit.], bacterial blight (*Bacterium sojae* var. *japonicum*) [*Pseudomonas glycines* var. *japonica*: ibid., 28, p. 513], purple speck (*Cercosporina* [*Cercospora*] *kikuchii*) [ibid., 8, p. 221; 28, p. 155], frog-eye leaf spot (*Cercospora daizu*) [ibid., 16, p. 492], anthracnose (*Glomerella glycines*) [ibid., 6, p. 74; 19, p. 512], and rust (*Phakopsora sojae*) [ibid., 13, p. 398; 15, p. 401].

Lorenz (R. C.). **A new leaf disease of Hevea in Peru.**—*J. For.*, 46, 1, pp. 27–30, 3 figs., 1948. [Received May, 1952.]

Details are given of the symptoms, geographical distribution, practical importance, and control of *Hevea* leaf spot (*Pellicularia filamentosa*) [*Corticium solani*], which attacks *H. brasiliensis* and *H. guianensis* var. *lutea* throughout Peru [*R.A.M.*, 31, p. 294]. Hitherto, in the absence of top-budding clones combining resistance to both leaf spot and South American leaf blight (*Dothidella ulei*) [loc. cit.], the former has severely retarded growth, prolonged the period of expensive maintenance, delayed top budding operations, and will set back latex production on a commercial scale. In small areas of one plantation many trees have been killed. The high-yielding Eastern clones GA. 49 and GA. 1279, although infected, are growing well.

Tavernetti (J. R.). **Heat is best for soil sterilization.**—*Pacif. Cst Nurserym.*, 9, 8, pp. 14, 32, 1950.

A brief, popular account is given of soil sterilization by heating, with notes on the technical terms used in connexion with the process, the sources of heat (natural gas, bottled gas, fuel oil, and electricity), heat requirements for pasteurization,

methods of dry and moist heating, and types of equipment used [cf. *R.A.M.*, 14, p. 460; 17, p. 761; 22, p. 110; 28, p. 581; 29, p. 119, *et passim*].

Angell (H. R.). **Seedling blight. IV. Effect of source of isolates of Pythiaceae on percentage stands of Poppies and Peas on four steamed soils.**—*Aust. J. agric. Res.*, 2, 3, pp. 286–294, 1951.

In further studies on seedling blight in Australia [*R.A.M.*, 30, p. 628] the author investigated the influence of the source of several pathogenic isolates, some of the *Pythium ultimum* type [cf. ibid., 29, p. 361] and others of the *P. mamillatum* type, on the percentage stands of poppies (*Papaver somniferum*) and peas. Isolates from peas from Duntroon and Belanglo soils were generally more pathogenic to peas than isolates from peas and poppies from the experiment station (Canberra) soil. Isolates from poppies from Belanglo soil were generally more destructive to poppies than isolates from the other sources. It was apparent that the host species from which an isolate was obtained could influence the result. There was more variation in pathogenicity within than between the two *P.* species; therefore, from an agricultural aspect, investigation of the basis of variation within species should receive first attention.

Thomas (C. A.). **Transmission of Safflower rust on treated seed.**—*Phytopathology*, 42, 2, pp. 108–109, 1952.

In 1950 some isolated fields in Kansas, Colorado, and California planted for the first time with seed of N 8 safflower treated with ceresan M developed varying amounts of rust (*Puccinia carthami*), presumably originating in the seed [*R.A.M.*, 29, pp. 172, 534]. In tests in 1950 at the Plant Industry Station, Beltsville, Maryland, to determine the efficiency of seed treatment in the control of the disease, ceresan M (the fungicide most extensively used) failed to eliminate infection completely, though at the excess rate of 9 oz. per bush. it lowered the incidence from 18·2 per cent. in the untreated lots to 0·02 per cent.; at this strength, however, the treatment usually reduced emergence. Parzate and phygon XL at excess dosages gave absolute control in a limited number of trials, and the plants from the treated seed were free from injury. Seed treated with arasan, dow 9B, and seedox at excess rates and panogen at 2 oz. per bush. gave rise to plants with 0·25, 0·36, 1·5, and 1·65 per cent. infection, respectively.

Costa (A. S.) & Penteado (M. P.). **O Milho como planta-teste para o vírus do mosaico da Cana de Açúcar.** [Maize as a test plant for the Sugar-Cane mosaic virus.]—*Bragantia*, 10, 3, pp. 93–94, 1 pl., 1950. [English summary.]

In another series of experiments at the Agronomic Institute, Campinas, São Paulo, Brazil, with maize seedlings as test plants for sugar-cane mosaic virus [*R.A.M.*, 31, p. 88], at least four out of 33 inbred lines of maize derived from the Catêto, Armour, Cristal, and Amarelão [Yellow] varieties proved to be susceptible. They were similarly affected by the virus responsible for a mosaic disease of *Cymbopogon nardus* (probably a strain of the sugar-cane mosaic virus) [cf. ibid., 29, p. 256 and next abstract]. A comparable reaction was displayed by many of the 113 maize varieties tested, including 174-Pride of Saline, 440-Prolifics, 936-Hybrid Kys×5120, 1082-Michelson's Giant Yellow Dent, 1181-Hybrid Double Argentine No. 93, and 1223-B8.

Costa (A. S.), Lima (A. R.), & Jacob (A.). **Mosaico do Citronella.** [Citronella mosaic.]—*Bragantia*, 10, 10, pp. 301–304, 1 pl., 1950. [English summary. Received May, 1952.]

Cymbopogon winterianus in small-scale plantings in São Paulo, Brazil, is affected by a form of mosaic inducing symptoms resembling those of sugar-cane mosaic

virus [see preceding abstract]. Moreover, in comparative inoculation tests with the sugar-cane mosaic and *C. winterianus* viruses on their own hosts, sorghum, and maize [loc. cit.], similar effects were obtained, while the physical properties of the two do not differ significantly. It is concluded, therefore, that the *C. winterianus* mosaic virus belongs to the sugar-cane mosaic virus complex.

Talbot (P. H. B.). **New and interesting records of South African fungi.**—*Bothalia*, 6, 1, pp. 183–204, 17 figs., 1951.

This descriptive list of new and interesting records of South African fungi includes *Cintractia leucoderma* [cf. *R.A.M.*, 30, p. 584] on *Rhynchospora cyperoides*, *Nigrospora oryzae* [ibid., 30, p. 559] on maize, *Torula herbarum* [on unidentified wood: cf. ibid., 10, p. 446], *Acremoniella atra* [cf. ibid., 25, p. 590] in cultures from maize seeds, and *Passalora graminis* [ibid., 3, p. 103] on *Dactylis glomerata*.

Talbot (P. H. B.). **Studies of some South African resupinate Hymenomycetes.**—*Bothalia*, 6, 1, pp. 1–116, 48 figs., 1951.

The South African resupinate Hymenomycetes studied in the present paper comprise 69 genera, including *Septobasidium*, *Corticium*, *Aleurodiscus*, *Merulius*, *Stereum*, and *Hymenochaete*. Keys are given to the species of six. Mention may be made of the following: *Helicobasidium purpureum*, only the *Rhizoctonia* stage of which has so far been found in South Africa, on potato [cf. *R.A.M.*, 26, p. 124], *Medicago* sp., and lucerne [ibid., 17, p. 44]; *Exobasidium vaccinii* on azaleas [*Rhododendron* spp.], including nursery plants imported from Belgium [cf. ibid., 25, p. 152]; *C. salmonicolor* on apple and oak (*Quercus reticulata*); and *Coniophora fodinarum* n.sp. on mine timbers. The last-named differs from *C. puteana* in being readily separable from the substratum when dry, in its greater thickness, in the organization of the hyphae and their deep brown colour in the basal layer, and the smaller spores (5 to 6·6 by 6·6 to 10 μ).

Wickerham (L. J.) & Burton (K. A.). **Occurrence of yeast mating types in nature.**—*J. Bact.*, 63, 4, pp. 449–451, 1952.

In studies at the Northern Regional Research Laboratory, Peoria, Illinois, typical strains of *Torulopsis sphaerica*, when grown together in the right combinations, produced ascospores typical of *Zygosaccharomyces lactis*. Spores were produced also when stock strains of *Z. lactis*, which had ceased to sporulate, were mated.

As *Sporotrichum anglicum* [*R.A.M.*, 17, p. 319] ferments several sugars with abundant formation of gas the writers would place it with the yeasts. Its distribution is world-wide, but it is almost invariably isolated as a haploid mating type, and all strains, including very old stock cultures, from Asia, Europe, and North and South America, are capable of mating and producing ascospores.

It is concluded that several species of heterothallic yeasts occur in nature mainly or partially as haploid mating types. Heterothallic species exist in stock culture collections under two accepted names, one applied to the non-sporogenous single mating type strains, and the other to sporogenous strains consisting of both mating types.

Seaver (F. J.). **The North American cup-fungi (Inoperculates).**—ix+428 pp., 76 pl. (1 col.), New York, published by the author, 1951.

This is a taxonomic treatment of the inoperculate Discomycetes known in North America, with keys to families, tribes, genera, and species. Three families are recognized, Geoglossaceae, Helotiaceae, and Cenangiaceae. As in his previous work on the operculate Discomycetes (1928), the author follows the former Ameri-

can code of nomenclature, so that some of the names and author citations will require change to agree with the International Rules. The treatment of the Sclerotineae is based largely on the work of Whetzel [*R.A.M.*, 25, p. 235], of *Helotium* on that of W. L. White (*Mycologia*, 34, pp. 154–179, 1942), and *Dermea* and *Pezicula* on that of Groves [*R.A.M.*, 21, p. 54; 26, p. 31]. Conidial and sclerotial states are described where known. Eighty generic names (including one new) are recognized, but some names commonly used are not accepted: *Diplocarpon rosae* and *D. earliana*, for example, are transferred to *Fabraea*, and *Dasyscypha calycina* [ibid., 30, p. 1] is given a nom. nov., *Lachnella hahniana*, the genus *Dasyscypha* being regarded as synonymous with *Lachnella*. Many of the species are restricted, as parasites or saprophytes, to parts of one or a few higher plants, and a host index is provided. Each plate shows both macroscopic and microscopic characters.

Venkataramani (K. S.). **A Tea root disease new to South India.**—*Nature, Lond.*, 169, 4313, pp. 1099–1100, 1 fig., 1952.

During a visit to some tea estates in Central Travancore in October, 1951, the author noted a small patch of unthrifty bushes which appeared thin, with a weak development of the branches and only a crown of unhealthy foliage. Feeding roots were completely lacking, and lesions ranging in size from minute spots to circular or somewhat elongated, raised patches 2 to 15 mm. across were present all over the bark of the tap and lateral roots and extended to the collar. Bark discoloration in the affected parts extended only a few cells deep in small spots, whereas in the larger ones the whole depth of the bark was affected and the wood also was occasionally discoloured just under the necrotic area. Sometimes the affected bark had dropped off, leaving a shallow scar or depression on the root surface. A species of *Cylindrocladium* [cf. *R.A.M.*, 30, p. 346; 31, p. 211] differing from *C. scoparium* [ibid., 30, p. 82] and other *C.* spp. in certain morphological characters was associated with the lesions.

De Jong (P.). **Copper fungicides in the control of blister blight of Tea in south India.**—*Plant Prot. Overseas Rev.*, 2, 4, pp. 17–22, 2 pl., 1951.

The author briefly reviews the results of spraying and dusting tests against blister blight of tea (*Exobasidium vexans*) [*R.A.M.*, 31, p. 403] carried out in southern India since 1947, already noticed in this *Review* [cf. ibid., 30, p. 588].

Powers (H. R.). **Water movement in Tobacco plants affected by black shank.**—*Plant Dis. Reptr*, 36, 4, p. 127, 1952. [Multilithed.]

Recent experiments in the Plant Pathology Laboratories, North Carolina State College, Raleigh, indicated that wilting of tobacco plants affected by black shank (*Phytophthora parasitica* var. *nicotianae*) [*R.A.M.*, 31, pp. 33, 212] is caused by local obstruction of water movement through the vascular elements. A stem cut off just above the lesion and kept in water regained its turgor after two hours, but those cut off below failed to recover however long they remained in water.

Vidali (A.). **Esperienze di lotta contro l'oidio del Tabacco (Erysiphe cichoracearum) effettuate in campo a mezzo di carbonato di litio.** [Experiments on the control of Tobacco *Oidium* (*Erysiphe cichoracearum*) in the field by means of lithium carbonate.]—*Notiz. Malatt. Piante, 1951*, 16, pp. 35–39, 1951. [Mimeographed. English summary, p. 68.]

The results of the previous year's greenhouse experiments on the control of *Erysiphe cichoracearum* on tobacco [*R.A.M.*, 31, p. 90] were not confirmed in field

tests near Orvieto, Perugia, Italy, in 1951, in which Bright Italia A.N. 16 and Virginia Bright 5 were sprinkled with a half or a quarter strength (0·685 or 0·3425 per cent.) solution of lithium carbonate when they had scarcely recovered from transplanting and again 25 days later. The treated plants, however, showed better growth and development than the untreated. Failure to control the disease may have been due to the low concentration used or to wrong timing of the applications. Further experiments are to be made using higher concentrations.

Stover (R. H.). **A strain of Tobacco mosaic virus causing vascular necrosis and wilt of Tobacco in Ontario.**—*Sci. Agric.*, 31, 10, pp. 424–428, 2 pl., 1951.

A new strain of tobacco mosaic virus [*R.A.M.*, 30, p. 631] was detected in 1949 when it caused extreme wilting and varying degrees of internal necrosis of Greenwood tobacco in a field near Ridgetown, Ontario. It differed from many 'streak' strains of the virus in that it caused no necrosis in tomato, though inducing severe necrosis in tobacco varieties carrying N^1 N^1 genes [cf. ibid., 22, p. 328] and a chlorotic mosaic mottle, stunting, and distortion in those carrying the n^1 factor, N^1 appearing to be incompletely dominant. A mutant of the virus differed from the parent strain in producing a bright yellow, instead of a green-yellow, mottle in tomato and n^1 tobacco. The scattered incidence in the field and the nature of the symptoms suggest insect transmission. The disease is so far of little economic importance.

Emge (R. G.) & Linn (M. B.). **Effect of spraying with zineb on the growth and zinc content of the Tomato plant.**—*Phytopathology*, 42, 3, pp. 133–136, 1952.

At the University of Illinois analyses of the zinc contents of Garden State tomato stems sprayed in the field with various organic zinc fungicides showed that those treated with zineb [*R.A.M.*, 29, p. 221; 31, pp. 303, 406] at 2 lb. per 100 gals. water generally contained the highest concentrations. The results of fruit analyses were inconclusive.

In the greenhouse young Early Baltimore plants were grown in a zinc-deficient and a complete Hoagland's solution and sprayed once (before or after the appearance of zinc deficiency symptoms [ibid., 27, p. 452]) with technical grade zineb (dithane Z–78, 98 per cent. active) at a concentration of 377 p.p.m. zinc, or zinc sulphate (136 p.p.m.), both in redistilled water. In the zinc-deficient solution significantly larger amounts of the element were found in the plants sprayed with zinc sulphate than in those treated with zineb, but there was no difference in growth rate between the two series. The growth rate of plants in a complete Hoagland's solution was materially increased by both compounds.

Chemical and biological assays of technical zineb did not disclose the presence of inorganic zinc as a residue from manufacture. The fungicide was shown to be soluble in water up to 5 p.p.m.

Linn (M. B.) & Wright (J. M.). **Tomato diseases and insect pests : identification and control.**—*Circ. Ill. Coll. Agric.* 683, 55 pp., 29 figs., 1951.

In this publication, a revision of Circular 428 of the same title, the authors briefly describe in popular terms the symptoms and control of the chief tomato diseases found in Illinois, further sections being devoted to seed treatment, soil sterilization, fungicides and insecticides, and spraying and dusting equipment. The Southland tomato variety [*R.A.M.*, 30, p. 635] is stated to be highly resistant to wilt (*Fusarium oxysporum* f. *lycopersici*) [*F. bulbigenum* var. *lycopersici*: cf. ibid., 31, pp. 260, 304] and to possess some resistance to blossom-end rot [cf. ibid., 29, pp. 88, 291].

Ciferri (R.). **Gli 'scopazzi': una virosi del Pomodoro affine alla 'aspermia' del Pomodoro in Italia.** ['Witches' broom': a virosis of Tomato allied to Tomato 'aspermy' in Italy.]—*Notiz. Malatt. Piante, 1951*, 16, pp. 16–20, 1951. [Mimeographed. English summary, p. 67.]

Samples of tomato plants received during 1949 from Castelsangiovanni, Piacenza, were bushy, owing to the cessation of apical growth and the development of lateral buds, with deformed or reduced leaves having a tendency to 'fern leaf' [cf. *R.A.M.*, 31, pp. 302, 406] and eventually developing interveinal spotting and chlorosis. The fruit yield varied from a third to a half that from normal plants, the fruits being smaller than usual, frequently asymmetrical, with light spots, and showing partial or total aspermy.

The disease was reproduced in tomato 16 to 22 days after sap inoculation and after 6 to 16 days in tobacco, which developed attenuated ring spots, mosaic, and interveinal necrosis. It was not transmitted to other solanaceous plants or cucumber. Of virus origin, it is believed to be related to aspermy virus [ibid., 31, p. 284], but differs from it in not infecting the Compositae, in the indistinct symptoms produced in tobacco, and various other minor points. The possibility of a double virus infection has not been overlooked, especially since tobacco and tomato plants were adjacent in the field. The disease has not reappeared.

Hitchins (P. E. N.). **Botrytis—stem sprayings seem the best precaution.**—*Fruit Gr., 1952*, 2949, p. 25, 1 fig., 1952.

After stating that in his nursery very few tomato plants have been lost through *Botrytis* stem rot [*B. cinerea*] since he adopted the practice of cutting out the infected stem patches and painting the cut surfaces with a fungicide [*R.A.M.*, 17, p. 567], the author reports that spraying the stems this year immediately after removing the lower leaves has reduced the number of infected patches from 100 or more found regularly during periodical searches in previous years to three or four.

Miller (P. W.). **Nut diseases in Oregon in 1951.**—*Plant Dis. Reptr*, 36, 4, p. 142, 1952. [Multilithed.]

A survey of walnut diseases in Oregon in 1951 [cf. *R.A.M.*, 30, p. 594] disclosed that black line or girdle [loc. cit.] affected 968 (69 per cent.) of the declining trees. None occurred on Persian rootstocks and, furthermore, the incidence of decline due to root rot [*Armillaria mellea*: ibid., 28, p. 94] or collar rot [unspecified] or both was no greater for Persian rootstocks than with those of the North California black walnut [*Juglans nigra*].

Editorial notes. Disease of the cricket bat Willow.—*Quart. J. For.*, 46, 1, p. 1, 1952.

In two instances recently cricket-bat willow (*Salix* [*alba* var.] *coerulea*) has been attacked [in Britain] by *Cryptomyces maximus* [*R.A.M.*, 11, p. 139], not hitherto recorded on this species. In stool beds in the autumn, shoots have large flat cankers like blotches of tar, 3 to 4 by 1 to 2 in. The bark beneath them dies.

Gravatt (G. F.). **Blight on Chestnut and Oaks in Europe in 1951.**—*Plant Dis. Reptr*, 36, 3, pp. 111–115, 3 maps, 1952. [Multilithed.]

Following a visit to ten European countries in 1950 and six in 1951 to give advice on problems connected with chestnut blight (*Endothia parasitica*) [*R.A.M.*, 29, p. 182 and next abstract] the author gives brief notes on the disease situation in Italy [loc. cit.], Switzerland [ibid., 30, p. 550], Yugoslavia [ibid., 31, p. 358], Spain [ibid., 28, p. 427], and the United States [ibid., 30, p. 143], on the search for resistant varieties, on infection of oak [ibid., 29, p. 182; 30, p. 550], and on the economic importance of the chestnut in Mediterranean countries.

Banti (G.). **Inchiesta sulla diffusione del 'cancro della corteccia' del Castagno (Endothia parasitica (Murr.) And.). II. Provincia di Genova.** [Survey of the distribution of 'bark canker' of Chestnut (*Endothia parasitica* (Murr.) And.). II. Province of Genoa.]—*Notiz. Malatt. Piante, 1951*, 16, pp. 4–15, 1 map, 1951. [Mimeographed. English summary, p. 67.]

As the result of a further study on the incidence of chestnut canker (*Endothia parasitica*) in Italy [*R.A.M.*, 30, p. 127; 31, p. 407, and preceding abstract] its distribution by communes in the province of Genoa is tabulated.

Hepting (G. H.) & Cummins (G. B.). **A new species of Peridermium on Virginia Pine.**—*Phytopathology*, 42, 3, pp. 115–116, 1 fig., 1952.

Peridermium appalachianum n.sp., first collected on Virginia pine (*Pinus virginiana*) in North Carolina in April, 1948, and subsequently in Tennessee, Virginia, and West Virginia, is characterized by orange, later pale yellow, cylindrical or tongue-shaped spermogonia, 2 to 7 by 1·5 to 5 mm., opening mostly by longitudinal slits; ellipsoid, narrowly diamond-shaped, or variable, finely rugose to verrucose peridial cells, 40 to 80 by 16 to 23 μ, often arranged in a labyrinthiform pattern; and long- or oblong-ellipsoid, rarely broadly ellipsoid or fusiform aecidiospores, 19 to 53 by 11 to 22 (mean 29 to 43 by 13 to 19) μ, with a hyaline, verrucose wall, 1 to 3 μ in thickness. The rust can work its way down a branch for 1 ft. or more, often entering the trunk. The girdling bark lesions, without hypertrophy of the wood cells, are more reminiscent of *Crônartium ribicola* than of *C. cerebrum* [*R.A.M.*, 29, p. 589] or *C. fusiforme* [ibid., 30, p. 592]. The part beyond the canker dies two or more years after encirclement.

The aecidia of *P. appalachianum* somewhat resemble those of *C. comptoniae* [ibid., 30, p. 349] but differ in their length and non-confluence, the paucity or absence of intrasoral filaments, and the shape of the aecidiospores. The new species also presents analogies with *P.* [*C.*] *filamentosum* [ibid., 30, p. 349] in the size, shape, mode of dehiscence, and distribution of the aecidia and in the absence of hypertrophy on the host. However, the aecidiospores of *P. appalachianum* are consistently longer and narrower than those of *P. filamentosum* (29 by 21 μ) and there is no evidence that the peridia of the former persist through the winter as do those of the latter.

Ribaldi (M.). **Su un caso raro di citosporiosi del Cedrus libani da Cytospora cedri Syd. et Butler — India.** [On a rare case of cytosporiosis of *Cedrus libani* caused by *Cytospora cedri* Syd. & Butler—India.]—Reprinted from *Ann. Fac. Agr. Perugia*, 5, 12 pp., 9 figs., 1948. [Received February, 1952.]

In November, 1948, *Cytospora cedri* was isolated from the trunk of a dying cedar of Lebanon [*Cedrus libani*] at Perugia, Italy. Wound inoculations of potted cedar seedlings gave negative results. An emended diagnosis is presented, in which the sporophore and spore measurements are given as 15 to 40 by 1 to 1·6 and 4·5 to 6·5 by 1 to 1·3 μ, respectively. Further work is in progress.

Ribaldi (M.). **Ricerche sulle alterazioni cromatiche di legname di Picea excelsa Lk. in Val Canale (Udine).** [Researches on staining in timber of *Picea excelsa* Lk. in the Canale valley (Udine).]—*Boll. Soc. ital. Biol. sper.*, 27, 4, pp. 653–655, 1 pl., 1951.

In 1949 and 1950 the surface of spruce timber undergoing seasoning in a sawmill near Gorizia, Italy, developed a blackish-fuliginous or light greyish discoloration, the former, which was the more prevalent, being caused by *Endoconidiophora* [*Ceratocystis*] *coerulescens* [*R.A.M.*, 30, p. 497], not previously recorded as parasitic on wood in Italy, and the latter by *Graphium penicillioides* [*C. piceae*: ibid., 16, p. 578; 31, p. 42]. In some cases the discoloration occurred near the galleries of *Xyloterus lineatus* [*Trypodendron lineatum*: ibid., 29, p. 509].